# PESTICIDES ABSTRACTS

**December 1977 - Vol. 10, No. 12**

**Abstracts 77-2581-2844**

**PSTAB 10(12): 661-715 (1977)**

**U.S. ENVIRONMENTAL PROTECTION AGENCY**

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*PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.*

*The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.*

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**77-2581.** Anonymous **Ontario team develops new pesticides.** *Can. Chem. Proc.* 61(9): 40-41; 1977.

Synthetic pheremones, which disrupt the mating or congregation of insects by overwhelming the natural pheremones secreted by the insects for communication, are likely to displace most chemical insecticides for insect control. However, in the next few years, synthetic pheremones will probably be used to enhance the effectiveness of insecticides, rather than to eliminate insect populations directly. While pheremones of some insect species are now available in commercial quantities, the technology is still in its initial stage. Most pheremones of significance are quite complicated and synthesis in the laboratory may involve as many as 13 or 14 steps. On the other hand, most pheremones are extremely potent; 100 mg/day distributed over a hectare of forestland would eradicate an insect species. Progress in pheremone research will probably be tied to government support, and the first application to be developed will probably be the control of agricultural, rather than forestry, pests.

**77-2582.** Environment Agency (Tokyo, Japan) **[Total list of priority measures of the environmental agency in 1978 for determining the required budget as compared to the actual budget for 1977.]** *Kankocho Kogai Senmon Shiryo (Official Data on Environmental Pollution)* 12(5): 1-11; 1977. (Japanese)

The principal preventive measures for environmental pollution by pesticides in 1978 will be item 5 (promotion of countermeasures for soil contamination and contamination due to pesticides), with a required budget amount of 271,768,-000 yen, compared to 208,712,000 yen for the actual budget of 1977. Specific items included were: investigation of pesticide residues in water and studies on determination of th persistence of pesticides with special stress on the establishment of standards for suspension of pesticide registration, investigation of pesticide residues, and studies of natural metabolites of pesticides, respectively requiring budgets of 20,498,000, 101,409,000 and 9,474,000 yen as compared to the actual (recognized by the congress) budget of 12,178,000 yen, 87,757,000 and 0,033,000 yen, respectively for 1977.

**77-2583.** Sokolov, M. S. ; Echkalov, A. P. (Inst. Agrochem. Soil Sci., USSR Acad. Sci., USSR) **Metodologicheskie printsipy ekotoksikologii pestitsidov [Methodologic principles of pesticide ecotoxicology]** *Khimiya* 6: 67-73; 1977. (26 references) (Russian)

Based on the Programme on Man and the Biosphere, Project 9, major principles of pesticide control are identified. Harmful effects of pesticides and the causes, types, and results of plant resistance to pesticides are discussed. The application of Project 9 (UNESCO) in the Soviet Union relative to the questions of organization, biological and chemical monitoring and the methodologic principles of pesticide ecotoxicology are elaborated upon.

**77-2584.** Reese, C. D. ; Kempter, J.; Brazzel, J. R.; Moorehead, G. ((Anim. Plant Health Insp. Serv., Plant Prot. Quar. Program, Washington, DC).) **An evaluation of the scouting activities of pest management programs.** *Natl. Tech. Inform. Serv.* PB-245,020, 72 p.; 1974.

The study evaluates the results of Government sponsored and private pest scouting activities as part of organized pest management. It discussed past and present scouting objectives, pest management objectives, mechanics of implementation, resource implications and effectiveness. It also deals with future constraints and projected costs as well as probable effectiveness of present scouting programs.

**77-2585.** Lindquist, D. A. (Joint FAO/IAEA Div. Atomic Energy in Food and Agric., Vienna, Austria) **Social and economic aspects of alternative insect control methods.** *Pestic. Sci.* 8(4): 389-393; 1977.

The development of alternative pest control methods offer a number of advantages over the conventional methods of pest control, under certain circumstances. These advantages will be discussed in the light of current social and economic pressures. In addition, the method of developing these alternative methods of pest control will be discussed in relation to the development of conventional methods of pest control. The so-called area-wide insect control schemes will be compared with farmer applied methods of insect control in relation to industry, training and economics. (Author abstract by permission)

**77-2586.** Stringini, P. (Science for the People, 897 Main Street, Cambridge, MA 02139) **Seveso: "Encouraging evidence"?** *Science* 197: 4308; 1977.

The article appearing in *Science* citing grounds for optimism with regard to the tragedy which occurred in Seveso, Italy, is called into question in a Letter to the Editor. The article is presented as an intentionally misleading public relations effort by Hoffman-La Roche pharmaceuticals to limit backlash against itself and its subsidiary, the Givaudan Corp., which was responsible for the accident involving chloracne and dioxin contamination of Seveso leading to its evacuation and causing perhaps irreparable damage to the environment and the inhabitants of Seveso. The article originated from a Hoffman-La Roche newsletter.

**77-2587.** Bassand, D. ; Carpy, S.; Matter, B. E. (Agrochem. Dept., Res., Sandoz Ltd., 4002 Basle, Switzerland) **Letter to the Editor** *Mutat. Res.* 46(5): 385-386; 1977. (5 references)

The article, "Cytogenetic hazards from agricultural chemicals. I. A preliminary study on the response of root meristems to exotoxin from *Bacillus thuringiensis*, a constituent of microbial insecticide, Thuricide, which recently ap-

peared in *Mutation Research*, is criticized as misleading in a Letter to the Editor because of misinformation. The active principle of the biological insecticide is not bacterial exotoxin, but a crystalline, high molecular weight protein, δ-endotoxin, that is associated with the spores of *Bacillus thuringiensis* Berliner, var. kurstaki. The safety of Thuricide is well documented and is exempted from residue tolerance for use on foods and forage crops by the EPA.

**77-2588.** Westoo, G. ; Noren, K. (Dept. Chem., Karolinska Inst., Fack, S-104 01 Stockholm, Sweden) **Polychlorinated 2-aminophenyl ethers in fish.** *Ambio* 6(4): 232-234; 1977. (15 references)

Two pollutants identified as 2',3,4,4',5-pentachloro-2-aminodiphenyl ether (PAE) and 2',3,4,4',5,6-hexachloro-2-aminodiphenyl ether (HAE) by gas chromatography and mass spectroscopy were found in the prepared extracts of fish caught in the Viskan river in Sweden. These compounds are closely related to the active ingredients in the moth-proofing agent Eulan WA Neu (EWN), are present as impurities in EWN, and can be prepared by hydrolysis of the active ingredients of EWN. Pike (*Esox lucius*) and eel (*Anguilla anguilla*) caught downstream from factories in the Viskan water system were analyzed for PAE and HAE; 0.4 mg/kg of these compounds were found in the eel. The acute toxicities of PAE and HAE were less than the acute toxicities of the active compounds in EWN as determined in a preliminary study with mice. Chronic toxicities of the compounds were not studied, but a preliminary study indicated that PAE and HAE accumulate in the tissues of mice.

**77-2589.** Anonymous **International conference on Chlorinated Phenoxy acids and their dioxins.** *Ambio* 6(4): 242-243; 1977.

The mode of action, health risks, and environmental effects of the phenoxy acids and their dioxins were evaluated at a conference held in Stockholm during February 7-9, 1977. It was concluded that the only dioxin found in phenoxy acid herbicides (PAH) which is of environmental concern is TCDD; it is found in 2,4,5-T and 2,4,5-TP. Levels commonly encountered in the soil after normal application of PAH are 1-2 ppm, and the soil half-life of PAH ranges from 3 to 10 wk. PAH levels in the green parts of target vegetation after normal spraying are about 200-500 ppm, the level decreasing to 20-50 ppm after 10 wk. Injected PAH may persist 4-6 yr within the woody parts of vegetation. The primary mode of degradation of TCDD on environmental surfaces is photolysis, and microbiological degradation occurs slowly in the soil. The half-life of TCDD in the soil is about 1-1.5 yr. There is virtually no downward movement of TCDD in the soil, and there is very little or no uptake of TCDD by vegetation from the soil. Bioaccumulation of TCDD resulting from normal use of 2,4,5-T is insignificant. Only very low levels of PAH are normally found in foodstuffs or in Swedish wildlife, fish, and waters. The mutagenic effect of 2,4,5-T and 2,4-D appears to be weak, although it must be concluded that TCDD is mutagenic. Risks associated with exposure to TCDD could be greatly reduced if manufacturers would utilize processes that minimize the formation of TCDD from trichlorphenol and that minimize potential contamination of the environment by TCDD in the event of an industrial accident. Strict precautions should also be taken to ensure safe disposal of TCDD-containing residues.

**77-2590.** Whittle, K. J. ; Hardy, R.; Holden, A. V.; Johnston, R.; Pentreath, R. J. (Tory Res. Station, Aberdeen, Scotland) **Occurrence and fate of organic and inorganic contaminants in marine animals.** *Ann. NY Acad. Sci.* 298: 47-79; 1977. (137 references)

Problems associated with marine pollution are discussed. The highest concentrations of pollutants occur in coastal areas, and are often maximized in local areas. Contamination of an organism depends not only on the concentration of the available pollutants, but also on its chemical nature, physical state, and whether the source of exposure is the surrounding seawater or the diet. Contamination occurs across absorptive surfaces such as those of the respiratory or gastrointestinal tract and selectivity may occur even among homologs. Deposition in tissues, accumulation, degradation, or depuration depends on tissue type, metabolic processes, detoxification mechanisms, and the adpative status of the particular animal. Hydrocarbon, pesticide, heavy metal, radionuclide, and miscellaneous organic pollutants are examined. Pesticides considered include aldrin, BHC, Chlordane, DDE, DDT, DDD, Dieldrin, Endosulfan, Endrin, HCB, Heptachlor, Mirex, PCB, Carbaryl, and Toxaphene. The substance of this study indicates that most data relate to the occurrence and distribution of biological contaminants and not to the underlying physiological process responsible for the contamination.

**77-2591.** Zoeteman, B. C. J. (Natl. Inst. for Water Supply, World Health Organization, Leidschendam, The Hague, The Netherlands) **International cooperation in studying the health aspects of organic contaminants in indirectly reused waste water.** *Ann. NY Acad. Sci.* 298: 561-573; 1977. (24 references)

Several aspects of organic pollution are discussed for which international cooperation would be of great mutual benefit for research conducted in the United States and Western Europe. Collaboration on data collection for individual organic compounds in water is considered: CEC and EPA libraries that contain data on aquatic contaminats should be stored in an accessible computer data base available to all potential users in the world. Coordination of research efforts is also important. Regular meetings to discuss unknown mass spectra of organic compounds and toxicologic screening of these compounds is necessary to prevent duplication of work and provide for rapid dissemination of data on high priority water contaminants. International standards and test methods should be developed for potable water: these criteria should be used for operation of treatment plants and for control of contaminants discharge. Greater cooperation is needed for epidemiological studies of the health aspects of indirect water reuse in order to establish internationally accepted methodologies for such studies so as to be able to extrapolate results obtained in one country to problems in other countries. The internation reference Center for Community Water Supply intends to pursue these goals.

**77-2592.** Kraybill, H. F. (Cancer Cause and Prevention, NCI, Bethesda, MD 20014) **Global distribution of carcino-**

**genic pollutants in water.** *Ann. NY Acad. Sci.* 298: 80-89; 1977. (35 references)

Problems associated with the management and control of carcinogenic pollutants are discussed. Sources of contamination, occurrence and frequency of distribution of contaminants, and treatment method are considered. Pesticide contaminants considered include aldrin, dieldrin, endrin, heptachlor, DDT, DDE, chlordane, BHC, and lindane. Research is needed to establish the relative hazard of micropollutants as contributors to the total environmental stress in cancer induction. It is suggested that concentrated mixtures and fractions of these water contaminants need to be studied in the laboratory to attempt to establish causal relations between them and cancer induction, and to establish possible synergistic effects.

**77-2593.** Charo, J. H. ; Taylor, A. W.; Freeman, H. P. (Agric. Chem. Management Lab., Agric. Environ. Quality Inst., U.S. Dept. Agric., Beltsville, MD 20705) **Comparative behavior of dieldrin and carbofuran in the field.** *Arch. Environ. Contamin. Toxicol.* 3(4): 437-447; 1977. (11 references)

To measure the amounts of dieldrin and carbofuran lost to the environment, we incorporated them into soils in small (0.6-1.1 ha) watersheds in separate years. The disappearance of each was monitored by periodically measuring residues in the soil, runoff, maize plants, and overlying air (dieldrin only). Soil residues were nonuniformly distributed. Best estimate for the time for 95% disappearance of dieldrin from the soil was 12.8 years. Carbofuran disappearance conformed to a first-order reaction and gave 95% disappearance times ranging from 145 to 434 days, depending on soil pH, moisture, and temperature. Runoff losses of both pesticides were highest in rainfalls during the first month after application. Over the season, dieldrin losses ranged up to 2.3% of that applied and were concentrated in the solids. Carbofuran losses in runoff occurred largely in the water and comprised up to 1.9% of the application. More than twice as much carbofuran (and metabolites) as dieldrin was accumulated in the maize plants, mainly in the leaves. Volatilization was an important route of dieldrin loss, amounting in the first year to 4.5% of that applied. Volatility of carbofuran, which was only 1/18th that of dieldrin in a laboratory test, was not measured in the field. The data show that use of optimum management practices can substantially reduce the environmental impact of agricultural applications of these pesticides. (Author abstract by permission)

77-2594. Anonymous. (Academy of Sciences, Zagreb, Yugoslavia) **Izvjestaj o radu u 1976. i plan rada za 1977. godinu Instituta za Medicinska Istrazivanja i Medicinu Rada JAZU u Zagrebu. [1976 Report and 1977 plan of the Institute of Medical Research and Industrial Hygiene of the Yugoslav Academy of Sciences, Zagreb.]** *Arh. Hig. Rada Toksikol.* 28(1): 93-126; 1977. (Croatian)

Report is presented in the 1976 activity of the Institute of Medical Research and Industrial Hygiene of the Yugoslav Academy of Medical Sciences, Zagreb. The mechanisms of the interaction of esterases with organophosphorus pesticides, the effects of such pesticides on animals and humans, the effects of pesticides on neuromuscular transmission and psychological function, and pesticide residues in the human body were studied within the framework of pesticides research. Magnesium chloride was found to inhibit the enzymatic hydrolysis and catalyze the non-enzymatic hydrolysis of DDVP (dichlorvos). The residue levels determined in the general population were 3.3 ppb for alpha-BHC, 4.1 ppb for lindane, 35 ppb for DDE, 12 ppb for DDD, and 23 ppb for DDT. Considerably higher levels were found in workers exposed to pesticides in production. Temperature and pH were found to influence the rate of degradation of DDVP in rivers.

**77-2595.** Henny, C. J. ; Olson, R. A.; Meeker, D. L. (U.S. Fish Wildlife Serv., Denver Wildlife Res. Ctr., Denver, CO 80225) **Residues in common flicker and mountain bluebird eggs one year after a DDT application.** *Bull. Environ. Contam. Toxicol.* 18(2): 115-122; 1977. (12 references)

Common flicker (*Colaptes auratus*) and mountain bluebird (*Sialia currucoides*) eggs were collected from a forested area in the northwestern United States which had been sprayed 1 yr earlier with approximately 0.75 lb DDT per acre. All eggs contained residues of DDT and its metabolites. Common Flicker eggs from the spray area averaged 0.58 ppm DDT, whereas those collected 0.5 or more mi from the spray area averaged 0.24 ppm DDT. Bluebird eggs from the spray area contained 5.29 ppm DDT, whereas those collected 0.1-1.0 mi away contained 2.61 ppm DDT and those collected 16-50 mi away contained 1.67 ppm DDT. The mean DDT level in American kestrel (*Falco sparverius*) eggs collected in the spray area at the same time was 6.42 ppm. The differences in the residue concentrations of bluebird and common flicker eggs appear to be related to different feeding habits in the two species: approximately 50-70% of the common flicker diet consists of animal food, whereas over 90% of the mountain bluebird diet is animal matter.

**77-2596.** Mahle, N. H. ; Higgins, H. S.; Getzendaner, M. E. (Analytical Lab., Dow Chem. Co., Midland, MI) **Search for the presence of 2,3,7,8-tetrachlordibenzo-*p*-dioxin in bovine milk.** *Bull. Environ. Contam. Toxicol.* 18(2): 123-130; 1977. (3 references)

Milk samples were obtained from dairy and beef-type cows on farms in Missouri, Arkansas, and Oklahoma. The animals had been grazing on pasture or range which had been treated with 2,4,5-T for control of brush and broadleaf weed. The milk was analyzed for TCDD using a gas chromatography-mass spectrometry technique. Homogenized whole milk from a Michigan supermarket was also analyzed as a control. The TCDD concentrations in all samples, including the control milk, varied from none detected to 1 ppt, the limit of detection of the method used being 1 ppt. Thus, TCDD contamination of the milk did not result from allowing cows to graze on pasture or range which has been treated with 2,4,5-T according to normal agricultural practice.

**77-2597.** Stewart, D. K. R. ; Gaul, S. O. (Res. Station, Agr. Canada, Kentville, Nova Scotia, Canada) **Persistence of 2,4-D, 2,4,5-T and dicamba in a dykeland soil.** *Bull. Environ. Contam. Toxicol.* 18(2): 210-218; 1977. (6 references)

Soil residue levels were monitoring for 55 wk following single surface spray applications of 2,4-D, 2,4,5-T, and dicamba to dykeland in a humid, temperature climate. The soil was silt loam of the Acadia Soil Complex. Residues were determined using electron capture gas chromatography. Small percentages of the applied iso-octyl esters of 2,4-D and 2,4,5-T persisted for several wk in this soil. The major soil residues resulting from application of the iso-octyl esters were the respective free phenoxy acids. The maximum soil residues occurred after 14-22 days, depending on the rate of application. 2,4,5-T residues were more persistent than 2,4-D residues at all application rates. The residues of both herbicides were found primarily at depths of 0-10 cm. The maximum soil residues following application of 2,4-D amine salts occurred after 14 days, and rapid decomposition of the herbicide occurred at 14-42 days after application. Loss of dicamba was also rapid, approximately 5% of the applied herbicide remaining after 42 days. With all three herbicides, more than 90% of the applied chemical had disappeared within 70 days, and after 55 wk, residue levels were 0.1% of the initial application or less. In no case were residues found beyond a depth of 20 cm.

**77-2598.** Leffingwell, J. T. ; Turner, E. R.; Futagaki, S.; Spear, R. C. (Dep. Biomed. Environ. Health Sci., Sch. Public Health, Univ. California Berkeley, CA 94720) **A field survey of dislodgeable Zolone residues in twelve commercially treated vineyards.** *Bull. Environ. Contam. Toxicol.* 18(2): 219-226; 1977. (3 references)

Leaf-punch samples from 12 commercial vineyards in the north-central San Joaquin Valley of California were collected before and at various times up to 35 days after treatment with zolane (phosalone). The insecticide was applied with ground equipment during the months of July and August, and pesticide residues on the levels were determined using flame photometric gas chromatography. A record of meteorological conditions which could affect the persistence of phosalone or its metabolites was kept. The patterns of phosalone disappearance and zoloxon formation in this study were qualitatively identical to those observed in a previous study, and the climatic conditions during the two studies were quite similar. The foliar residues of zoloxon were remarkably similar among fields and between studies regardless of application rate or gallonage applied. The data suggests that the pattern of phosalone decay in central California during the summer months is relatively invariant.

**77-2599.** Crecelius, E. A. (Battele, Pacific Northwest Div., Marine Res. Lab., Sequim, WA 98382) **Arsenite and arsenate levels in wine.** *Bull. Environ. Contam. Toxicol.* 18(2): 227-230; 1977. (7 references)

Nineteen samples representing 13 varieties of red and white domestic table wines were analyzed for arsenite, arsenate, methylarsonic acid (MAA), and dimethylarsinic acid (DMAA). The concentrations of arsenite ranged from less than 1 to 420 ppb, and the concentrations of arsenate ranged from 1 to 110 ppb. Most of the total arsenic was present as arsenite, MAA and DMAA being below the limit of detection (1 ppb) in all samples. Half of the samples analyzed greatly exceeded the U.S. maximum allowable drinking water standard of 50 ppb arsenic. The source of the high arsenic levels in some of the wines appeared to be the use of arsenicals in grape production. The fermentation process was found to reduce approximately 60% of added arsenate to the more toxic arsenite, but it did not methylate arsenite and did not demethylate MAA; a small fraction of added DMAA was converted to MAA. It is likely that the arsenic species taken up by the grape plants is arsenate, which is converted to arsenite during fermentation.

**77-2600.** Pierce, R. H., Jr. ; Brent, C. R.; Williams, H. P.; Reeves, S. G. (Inst. Environ. Sci., Univ. Southern Mississippi, Hattiesburg, MS 39401) **Pentachlorophenol distribution in a fresh water ecosystem.** *Bull. Environ. Contam. Toxicol.* 18(2): 251-258; 1977. (26 references)

Samples of water, particulate matter, sediments, leaf litter, and fish were taken from a 30-acre lake in Mississippi which had been contaminated with an undetermined amount of wood treating wastes containing pentachlorophenol (PCP). The contamination resulted in an extensive fish kill. The samples were analyzed using electron capture gas chromatography. A low background concentration of PCP was observed in samples from a clean control pond. The concentrations of PCP in the contaminated lake and the stream feeding it indicated that the fresh water ecosystem was incapable of assimilating the acute influx of PCP within 17 mo after the spill. Within 2 mo after the spill, the water and suspended particulate matter contained near background levels of PCP, indicating a short residence time from PCP in the water column. PCP concentrations in the sediment were much higher (1,200 ppb) than those in water; the concentrations in the lake sediments remained relatively constant throughout the study. The PCP concentrations in the leaf litter were also high, ranging from 1,680 to 6,400 ppb throughout the study period. Fish contained PCP for up to 6 mo following the spill, the concentration in small fish dropping to near background levels within 10 mo.

**77-2601.** Bogan, J. A. ; Newton, I. (Dep. Vet. Pharmacol., Univ. Glasgow Vet. Sch., Glasgow, Scotland) **Redistribution of DDE in sparrow hawks during starvation.** *Bull. Environ. Contam. Toxicol.* 18(3): 317-321; 1977. (3 references)

The distribution of DDE in the tissues of 18 sparrowhawks (*Accipiter nisus*) found dead throughout Great Britain was determined using electron capture gas chromatography. The birds ranged in condition from healthy to starved. Two eggs laid the day before death by one bird were also analyzed, and the dieldrin and PCB concentrations were measured in four birds. The percentage of DDE in the brain increased slowly with decreasing body lipid, but was marked-

ly higher in birds with less than 1.5% fat. The percentage increase in brain DDE with starvation was greater than the percentage increases in liver and breast muscle DDE with starvation. The brain lipid content decreased less during starvation than did the liver or breast muscle lipid contents. Although the liver and muscle DDE concentrations did not accurately reflect the brain DDE concentration, muscle or liver concentrations calculated on a lipid weight basis reflected the brain concentration more accurately than did muscle or liver concentrations calculated on a wet weight basis. The brain concentration of DDE calculated on a lipid weight basis was consistently lower than the liver or muscle concentrations calculated on the same basis. The concentration of DDE in the body lipid of one bird (39.7 μg/g) corresponded well to the DDE concentration in the lipid of her eggs (mean 38.0 μg/g). Thus, the DDE concentrations in egg residues appear to reflect the DDE concentration in the parent bird.

**77-2602.** Thompson, N. P. ; Rankin, P. W.; Cowan, P. E.; Williams, L. E., Jr.; Nesbitt, S. A. (Pesticide Res. Lab., Food Sci. Dep., Univ. Florida, Gainesville, FL 32611) **Chlorinated hydrocarbon residues in the diet and eggs of the Florida Brown Pelican.** *Bull. Environ. Contam. Toxicol.* 18(3): 331-339; 1977. (19 references)

Chlorinated hydrocarbon residues were monitored in 92 samples of regurgitated food from 14 Florida pelican ( *Pelicanus occidentalis*) colonies and in 40 apparently viable eggs from two colonies and three aparently nonviable eggs from a third colony. Analysis was done by electron capture gas chromatography. Chlorinated hydrocarbon residue levels in the diet did not vary between different locations, and there was no significant difference in residue levels from 1970 to 1971 except in the case of PCBs, which increased significantly. In general, the chlorinated hydrocarbon residues in the food were comparable to or below other reported fish residues in the United States. The average residues found in this study did not appear to be of sufficient magnitude to be injurious to the Brown Pelicans or their young. The egg samples showed no observable shell thinning, and the DDT residues (average 1.27 ppm) in the eggs were well below levels associated with shell thinning. In general, residue levels were similar in eggs from the same nest and were higher in eggs from the east coast than in eggs from the west coast. It is unlikely that the residue levels observed in this study could cause reproduction problems in Florida pelicans.

**77-2603.** Adams, J. D. ; Iwata, Y.; Gunther, F. A. (Dep. Entomol., Univ. California, Riverside, CA 92502) **Worker environment research V. Effect of soil dusts on dissipation of paraoxon dislodgable residues on citrus foliage.** *Bull. Environ. Contam. Toxicol.* 18(4): 445-451; 1977. (14 references)

Ten ml of a 200 ppm aqueous solution of paraoxon was shaken for 2 hr with 5.00 gm of soil dust, after which slurries of the dust were applied to Teflon sheets and the leaves of Valencia orange trees. The foliar residues were extracted and quantitated. Initial dislodgable paraoxon residues from leaves were 49, 42, 38, 31, 41, and 45 μg/leaf for Laveen loamy sand, Santa Lucia silt loam, Windy loam, Madera sandy loam, Visalia silt loam, and Pike's Peak clay dusts, respectively. The corresponding initial residues from the Teflon sheets (control) were 41, 39, 38, 41, 44, and 38 μ/sheet, respectively. Data for dislodgable residue levels as a function of time indicated that, except for Pike's Peak clay, the residue levels declined with time at a slower rate after about 10 days; in the case of the Madera sandy loam and Windy loam dusts, the data deviated significantly from linearity. The half-life of paraoxon sorbed to any of the six dusts was probably greater than 22 days, the rate of dissipation after the first 10 days being slower. There was no apparent relation between organic content of the soils and paraoxon residues after 30 days, but high clay content was associated with high paraoxon retention. There appears to be more than one mode of paraoxon adsorption to the dusts, and at least one of these modes appears to impart a greater stability to paraoxon than the other modes. Adsorption to the internal surfaces of clays may be the mode of binding which limits the dissipation of paraoxon from soils.

**77-2604.** Shadoff, L. A. ; Hummel, R. A.; Lamparski, L.; Davidson, J. H. (Anal. Lab., Dow Chem., Midland, MI) **A search for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) in an environment exposed annually to 2,4,5-trichlorophenoxyacetic acid ester (2,4,5-T) herbicides.** *Bull. Environ. Contam. Toxicol.* 18(4): 478-485; 1977. (11 references)

As part of a broad study to determine whether TCDD (dioxin) is accumulating in the environment due to the approved usage of 2,4,5-T-based herbicides, samples of fish, water, mud, and human milk were collected from areas in Arkansas and Texas where 2,4,5-T herbicides are used and were analyzed for TCDD. No TCDD was detected by a gas chromatographic-mass spectrometric procedure with a detection limit which averaged less than 10 ppt. Thus, annual, 2,4,5-T usage in the two study areas did not result in any apparent environmental accumulation of TCDD.

**77-2605.** Popendorf, W. J. (Sch. Pub. Health, Univ. California, Berkeley, CA 94720) **Foliar residue calculations: for one leaf you get two sides.** *Bull. Environ. Contam. Toxicol.* 18(4):497-498; 1977. (3 references)

A personal survey of the attendees of a 1976 Symposium on Pesticide Residue Hazards to Farm Workers indicated that half of the researchers considered only one side of the leaf and half considered both sides of the leaf when reporting foliar residue levels as mass of pesticide per unit area. To compare data from researchers using the different approaches, one must either have reported data based on one side of the leaf or double data based on two sides. It is suggested that when reporting foliar residue data in the near future, the basis upon which the area was calculated should be indicated.

**77-2606.** Getzin, L. W. (W. Washington Res. and Extension Ctr., Washington State Univ., Puyallup, WA 98371)

**Persistence of the insecticide, Akton, in soil.** *Bull. Environ. Contam. Toxicol.* 18(4): 499-502; 1977. (3 references)

A study was initiated to determine the persistence of Akton (0-(2-chloro-1-(2,5-dichlorophenyl)vinyl)0,0-diethyl phosphorothioate) in the soil, a residual soil surface treatment for cinch bugs and sod webworms. Triplicate 35 x 15-ft plots were treated with 1% granular Akton at 2 lb AI/A and with 4E emulsifiable concentrate sprays at 2 and 10 lb AI/A. Another group of fields served as controls. Corn was planted on all fields for 3 yr, for the 4th and 5th yr the fields were left fallow. Normal land preparation and cultivation practices were employed throughout this period except that tillage was restricted to the top 4 in of soil to minimize mechanical transfer of soil below the sampling zone. Soil samples were taken at irregular intervals over the 5-yr period. Akton residues were measured with a gas chromatograph equipped with a selective thermionic flame detector. Logarithmic decay curves for the Akton soil treatments were constructed from the data. Akton followed a first order degradation rate which suggests that a single mechanism is responsible for the decay of Akton in soil. Akton exhibits a much greater stability than other organophosphorous insecticides and is one of the most persistent organophosphorous insecticides studied to date.

**77-2607.** Begley, J. ; Reichert, E. L.; Siemsen, A. W.; Rashad, M. N.; Klemmer, H. W. (Hawaii Epidemiol. Stud. Program, Pacific Biomed. Res. Cent., Univ. Hawaii, Honolulu, HI) **Association between renal function tests and pentachlorophenol exposure.** *Clin. Toxicol.* 11(1): 97-106; 1977. (17 references)

Data are presented and renal function tests and PCP measurements on consecutive blood and urine samples collected from 18 workers at a wood treatment plant before, during, and after a 20-day vacation. PCP concentrations in blood averaging 5.1 ppm before vacation fell to 2.2 ppm during vacation but with a temporary rise early in this nonexposure period, suggesting a body tissue store of PCP which was mobilized in response to a negative PCP balance. Urine PCP concentrations showed similar but less marked variations. Creatinine clearance and phosphorus reabsorption values were depressed before vacation but showed significant improvement during vacation, suggesting that PCP exposure reduced both glomerular filtration rate and tubular function, with recovery following a nonexposure period. (Author abstract by permission)

**77-2608.** Sneeringer, P. V. ; Belkin, F.; Straffon, N.; Costick, S. A. (U.S. Army Environ. Hyg. Agency, Aberdeen Prov. Ground, MD 21010) **The army's drinking water surveillance program.** *Environ. Sci. Technol.* 11(8): 767-771; 1977.

Following publication of a Public Health Service report stating that existing drinking water surveillance in 1970 was inadequate, the Army Environmental Hygiene Agency established a drinking water monitoring program. Water samples are collected annually from Army installations throughout the world. Surface water samples are analyzed for 53 chemical constituents (minerals, nutrient, metals, pesticides, and radionuclides) and physical parameters; similar analyses are performed on groundwater samples, except that pesticides are analyzed triannually. Questionable findings in categories of medical acceptability for a water source are followed by repeated analyses and, if indicated, by closure of the water source. Sample data sheets are presented, in which pesticides findings are stated for xendrin, lindane, DDT, dieldrin, and heptachlor epoxide. Organochlorine pesticide levels in excess of the health-reference concentration limits were not detected at all in the years 1972-1976.

**77-2609.** Fedorova, L. M. ; Belova, R. S.; Kovtunova, N. E.; Kiriukhina, N. N.; Volchonok, H. G. ((Saratov Scientific Research Institute of Rural Hygiene, RSFSR Ministry of Public Health, Saratov, USSR)) **Soderzhanie ostatkov khlorfenoksiuksusnykh kislot v okruzhaiushchei srede i organizme cheloveka. [Residue levels of chlorophenoxyacetic acids in the environment and in the human body.]** *Gig. Sanit.* (6): 101-103; 1977. (3 references) (Russian)

Samples of fodder, animal organs, cow's milk, human diet, and human autopsy specimens were analyzed for 2,4-D by thin-layer chromatography. Twenty-one to 92% of all fodder samples were positive; this percentage was highest for samples collected during the third quarter of the year, and lowest during the first 6 months. Sixty-three per cent of animals' organs (muscles, livers, and kidneys) contained 2,4-D; the average concentration was 0.031 ± 0.009 mg/kg (0.038 ± 0.019 mg/kg in muscles, 0.038 ± 0.011 mg/kg in livers, and 0.019 ± 0.004 mg/kg in kidneys). The highest levels were found in animals killed during the third quarter. Eighteen of 46 milk samples were positive for 2,4-D. Daily food samples from institutional catering services were positive at rates of 35-50%; the 2,4-D levels were in the range of 0.025-0.13 mg/day. Autopsy specimens (kidneys, livers, muscles and gonads) from human cadavers (33 men, 37 women) were positive in 8 cases (5 men, 3 women); the residue levels did not exceed 0.02 mg/kg, and were highest in the kidneys. The findings indicate that fodder is the principal source of 2,4-D in food and the human body. The waiting time imposed on the use of millet and corn as animal feed after treatment with 2,4-D should be increased from 45 to 100 days.

**77-2610.** Yakubov, A. Ya. (Dushanbe Inst. Epidemiol. Hyg., Dushanbe, USSR) **K voprosu o zonirovanii stepeni "pestitsidnoi opasnosti" i urovnei zabolevaemosti v raznykh zonakh [Defining the perimeters of pesticide danger and the morbidity rate in different areas.]** *Gig. Sanit.* 5: 73-76; 1977. (6 references) (Russian)

The level of pesticide contamination of the environment, the distribution of toxins under different methods of cotton processing, and the morbidity rate of people who live in and around where pesticides are used are given. Depending on the pesticide level in the air, the area under study was divided into three zones of pesticide danger. The most dangerous, Zone 1, included the fields under study and the area within the radius of 50-200 m. The relatively dangerous Zone

2 and the danger free Zone 3 covered the areas within a radius of 300-700 and 800-1000 m from the experimental fields, respectively. The concentration of pesticides and the duration of their residues in air, buildings, the water, and food depend on the dosage and type of the compound used, the manner of fertilization, and the frequency of cotton harvesting. Depending on the daily level of pesticide consumption in humans, the affected populations could be divided into 4 groups according to the effect of toxins of various strengths. Pesticide residues in the environment are the major cause of many diseases of the gastrointestinal tract, chronic gastritis, etc.

**77-2611.** LaFleur, K. S. (Agron. Soils Dep., College Agric. Sci., Clemson University, Clemson, SC 29631) **Movement of carbaryl through Congaree soil into ground water.** *J. Environ. Qual.* 5(1): 91-92; 1976. (6 references)

Carbaryl (25.4 kg/ha) was applied to a Congaree sandy loam fieldplot containing a shallow (about -1.1 m) water table. Movement and loss in the soil profile, and accumulation in underlying ground water were monitored for 16 months. Rainfall during this time was 182 cm (3.5 pore volumes based on the upper 1 m of soil). The upper 1 m contained about 6% of the applied carbaryl after 16 months. No carbaryl was found in the 0-20 cm layer after the 4th month. Loss of carbaryl with time in the upper 1 m was concentration-dependent. Time to half-concentration within the upper 1 m was $<1$ month. Carbaryl appeared in the underlying ground water within 2 months after soil application and persisted through the 8th month. Maximum groundwater concentration, about 0.3 μmol/liter, occurred at the end of the second month. (Author abstract by permission)

**77-2612.** Onishchuk, S. K. (Nizhnedneprov'e Sci. Res. Inst. Oenol. Viticult., USSR) **Vliianie simazina na vinograd i sornuiu rasitel'nost' v Nizhnedneprov'e [The effect of simazine on grapes and weeds in Nizhnedneprov'e]** *Khim Sel'sk, Khoz.* 15(3): 63-66; 1977. (6 references) (Russian)

A 6 yr experiment was conducted to determine the effect of simazine on grapes and weeds. Some 33.6 kg of simazine were used for the period, which comes to 10 kg/ha or 1.68 kg/ha annually. The total area covered 1.51. ha. The number of weed species varied from year to year from 20 to 26 per $m^2$ in 1970 to 404-876/$m^2$ in 1972, with the smallest number (2-3% of the control group) during the last 2 yr of herbicide application. There was no proliferation of weeds immune to the weed-killer. The growth and development of the grapes were normal, and the level of sugar and acid in the berries was 0.2 and 0.4 g/l higher than in the control. No residue was found in the grapes after a 3 yr application of the compound, and 0.1 mg of the toxin per kg of grapes was discovered after a 6 yr use of the herbicide. To avoid this, a 2 yr break after a 3 yr application is recommended.

**77-2613.** Nikoaeva, N. G. ; Shutkina, A. T. (Kishinevskii SKHI, Kishinev, USSR) **Triazinovye gerbitsidy v yablonevykh sadakh Moldavii [Triazine herbicides in apple orchards of moldavia.]** *Khim. Sel'sk. Khoz.* 15(3): 59-63; 1977. (Russian)

A 9 yr experiment was conducted to determine the effect of triazine herbicide on the soil as well as on the growth and fruit bearing of Jonathan apples. Simazin (4,5 and 6.0 kg/ha) was used for 3 yr, which was followed by a 3 yr observation period after which atrazine (2,3, and 4 kg/ha) was applied for another 3 yr. Regularly watered testing ground measured 6 x 6 m, with 9 trees on it. It was found that prolonged use of *S*-triazine changes conditions for the growth and fruit bearing of apples. There were fewer species of weeds, with hairy crabgrass resisting both herbicides, which were found in the largest amounts at 0-30 cm from the surface and were distributed by the type. The authors conclude that a prolonged use of triazine gradually changes the biochemical processes in the fruit, weakens the saccharose synthesis, and contributes to the development of large amounts of fruit sugar.

**77-2614.** Abramova, K. A. ; Panasyuk, T. D.; Nikanorova, E. A. (No author address given) **Ustoychivost tordona 22K v pochve i posledeistvie ego na kulyturnye rasteniia [*Stability of Tordon 22K in the soil and its residual effect on crops.*] *Khim. Sel'sk. Khoz.* 15(3): 55-58; 1977. (8 references) (Russian)**

Results of a 4 yr experiment with Tordon 22K (picloram) to determine its effect on the Russian sweet-sultan and cereal crop are given. It was found that 98% of Tordon 22K dissolves 46 mo after it was applied (at 1 kg/ha) to a rather dry solonetz soil. Corn and panicum were found to be most resistant to the herbicide. Tordon had no negative effect on winter wheat 3 yr after its application and its amount was 0.01 mg/kg in 0-40 cm of the top layer. There were larger concentrations of the herbicide in plants than in the soil where the plants grew. Tordon residues in the soil are potentially dangerous to such sensitive crops as bean, tomato and sunflower.

**77-2615.** Kavolyunaite, I. A. ; Melamed, B. V.; Shpokauskas, A. K. (Vokeskii filial Litovskogo NII zemledeliia, USSR) **Nakoplenie trikhloratsetata natriia v rasteniiakh i pakhotnom sloe pochvy [The level of trichloroacetate sodium in plants and soil.]** *Khim. Sel'sk. Khoz.* 15(4): 65-70; 1977. (6 references) (Russian)

A 3 yr experiment was conducted to determine residues of trichloroacetate sodium (TAS) in potato, root vegetables and pulse and cereal crops, and its duration in soddy brown podzolic soil over an area of 100 $m^2$. The weed-killer was applied at 30 kg/ha in the fall and 25 kg/ha in the spring. Spectrophotometry was used to measure the level of the toxin in soil and plants. TAS residue in plants depended on the time of fertilization and the type of crop. Herbicide distribution in different parts of a plant was uneven. There was no residue in the roots of pulse crops when TAS was applied in the fall, and very little of it when the fertilizer was used in the spring. Nor was there any TAS residue in the aerial part of a plant at the beginning of vegetation when the pesticide was used

in the fall. In the case of peas and lupin, TAS residue was present until the harvest time, and the residual level was higher in cereal than in other types of crop when the herbicide was used in spring. The persistence of TAS residue in the soil depended on the time of fertilization; when it took place in the fall, the herbicide (2.9-19.4 mg/kg of dry soil) was found at 0-20 cm below the ground for potato and turnip 2-4 wks after fertilization, and it remained there until the first frost. The level of TAS residue in the soil was much higher when the fertilizer was used in the spring, and it remained in the ground for various lengths of time depending on weather conditions. TAS had no appreciable effect on microorganisms in the soil.

**77-2616.** Bezuglov, V. G. ; Postoeva, R. A. (NII selyskogo khoziaistva tsentraljnykh raionov nechernozemnoi zoni, USSR) **Gerbitsidy v sevooborote i kachestvo urozhaia. [Herbicides at the time of crop rotation and the quality of harvest.]** *Khim. Sel'sk. Khoz.* 15(4): 59-63; 1977. (10 references) (Russian)

The effect of prolonged use of herbicides at the time of crop rotation on the quality of farm produce was studied for 8 years. The experiment was conducted on peas, potatoes, barley, and clover with pesticides generally used for crop rotation (simazine, atrazine, MCPA, MCPA, 2-4D, dicamba, and Prometone). Systematic application of the herbicides proved highly effective in weed control. The quality of farm produce was not affected by the chemicals nor were there any residues in the crop.

**77-2617.** Buryi, V. S. ; Popovich, N. A.; Sannikov, G. P. (All-Union Scientific Research Institute of Hygiene and Toxicology, USSR) **Dinamika razlozheniia dalapona v vode. [Dynamics of the degradation of dalapon in water.]** *Khim. Sel'sk. Khoz.* 15(8): 29-31; 1977. (14 references) (Russian)

The degradation of dalapon in water was studied under various conditions. Along with other pesticides, dalapon was used for weed control along creeks and irrigation canals at an expenditure of 40 kg/ha. The dalapon concentrations measured in water samples taken within a distance of 100 m froam the source during the first five days after treatment were well below 1 mg/liter, and the concentrations measured in algae and higher aquatic plants were below 1.5 mg/kg. Stagnant water was treated at an expenditure of 30 kg/ha; the initial dalapon concentration in the water was 0.4 mg/l, and 0.15 mg/l was measured 15 days later. Under laboratory conditions, dalapon added in a concentration of 2 mg/l was detectable for 10 days. When added in concentrations of 5-20 mg/l, the concentrations measured after 40 days were 0.25-1.4 mg/l. Usual water treatment (coagulation with aluminum sulfate, settling for 1.5-2 hr, chlorination and filtration) reduced the dalapon concentration from 2 to 0.09 mg/l. Irradiation with a mercury vapor lamp caused degradation to the extent of 85-90% in a short time. The findings indicate that dalapon can be used without hazards for the control of aquatic plants at rates of up to 40 kg/ha.

**77-2618.** Harris, L. E. (Int. Feedstuffs Inst., Utah State Univ., Logan, UT) **Guide for estimating toxic residues in animal feeds or diets.** *Natl. Tech. Inform. Serv.* PB-243,748, 384 p.; 1975.

The report is a tabulation developed to aid EPA pesticide petition reviewers in constructing typical animal diets for the purpose of estimating residues in meat/milk/eggs. The scope of the tabulation is to cover all feed components currently used in animal husbandry, the range of their percentage composition of commercial livestock diets, the physical state of the feed component as ingested (wet weight, dry weight), and limitations which might apply to the feeding practice (from economics of shipping, availability, etc.). (Author abstract by permission)

**77-2619.** Osaki, Y. ; Nakamura, S. (Cent. Environ. Pollut. Publ. Health, Fukuoka Prefecture, Fukuoka, Japan) **Trend of pesticide residues in crops grown in Fukuoka Prefecture.** *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 24(9): 592-598; 1977. (42 references) (Japanese)

Results of determination of pesticide residues in agricultural crops in Fukuoka Prefecture since 1970 were compared. The numbers of samples examined were 48 in 1970, 55 in 1971, 60 in 1972, 48 in 1973, 65 in 1974, and 57 in 1975, and the species examined included strawberry, cabbage, spinach, potato, summer orange (and peel), grape, and tea. The general trend of results were as follows: although a yearly reduction of BHC residue was recognized, a very small amount (0.001 ppm) was still found in some samples, especially in spinach as well as in field soil, suggesting sporadic detection in the near future. DDT has come not to be detected, except for cucumis fruits at 0.003 ppm and root vegetables at 0.019 ppm, dieldrin has come not to be detected; however, a constant lookout should be kept on cucumis fruits, root vegetables and beans. Other pesticide residues were not over the standard, and it is thought that they will never be over the standard if the standard of application is maintained.

**77-2620.** Kasai, A. ; Asanuma, N.; Suzuki, A.; Kurosawa, K. (Author address not given) **[Studies on organochlorine pesticides residues in human bodies. Part 8. (including Hg content of hair).]** *Nihon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 310-311; 1977. (Japanese)

Organochlorine pesticide residues ($\alpha$, $\beta$ and $\gamma$-BHC, P,P'- and OP'-DDT, P,P'-DDE and dieldrin) were determine in 76 samples of adipose tissues obtained during surgery or autopsy. The maximum, minimum and average values in 1977 were as follows in the above order: 0.744, 0.023, and 0.084; 21.67, 0.433 and 2.705; 0.134, 0, and 0.006; 5.585, 0.159 and 0.886; 1.377, 0 and 0.107; 45.63, 0.119 and 5.391; and 1.388, 0.036 and 0.204 ppm. It was noticed that although it has been 8 years since these pesticides were banned, a relatively large amount was still found in the human body. There was a marked and significant difference in the amount of these pesticide residues in adipose tissue between younger (20-39 years old) and older (over 70 years old) people. Mercury content of hair of the same persons did not show marked

changes, and the values are higher in non-farming persons (men and women) than in farming persons (men and women). The level was about 6-2 ppm.

**77-2621.** Takamiya, T. ; Uchida, A.; Ishige, T. (Inst. Rural Med., Faculty of Med., Chiba Univ., Chiba, Japan) **[Concentrations of methyl mercury in human hair and organochlorine pesticide residues in human blood (continued).]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 314-315; 1977. (1 reference) (Japanese)

After finding very high methylmercury values in hair of men living in a town in Chiba Prefecture (1976), the value was traced continuously for a year, and the correlation between methylmercury in hair and organochlorine pesticide residues in blood of control subjects was studied and considered in relation to the food chain carrying such pollutants (fish and shellfish). The results of tracing methylmercury in hair indicated that except for 2 persons whose values showed a relatively clear reduction, the other 7 person's values remained on the same level, suggesting that the cause lied in factors of daily environmental life. No correlation between methylmercury and P,P′-DDT in blood was observed, and 2 cases showed very high concentrations of methylmercury (over 16 ppm) in hair very low levels of P,P′-DDT, 3 ppb. No methylmercury was detected in drinking water from a well. The necessity of investigating their living conditions including diet was considered.

**77-2622.** Sasaki, S. ; Sugaya, T.; Suzuki, Y. (Inst. Rural Med., Hiraga General Hospital, Hiraga, Akita, Japan) **[Residual amounts of organochlorine pesticides in human bodies, 1976.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 312-313; 1977. (Japanese)

Organochlorine pesticide residues were determined in 21 samples of human milk supplied by mothers who gave birth in the hospital and in 20 organs and adipose tissues collected at operation or autopsy in the hospital. The percentage of detection, and average values of α- and β- BHC, O,P′-DDT, P,P′-DDE and dieldrin in human milk was 91, 0.053; 100, 1.603; 14, 0.032; 43, 0.261; 100, 2.248 and 71, 0.130 ppm/fat. The content (average) of the same in the liver, the spleen and the kidney was as follows, α- and β- BHC was 0.002, 0.002 and 0.012 ppm; 0.074, 0.025 and 0.324, total DDT was 0.120, 0.067 and 0.518 ppm; dieldrin was 0.003, 0.004 and 0.060 ppm/tissue. As usual, the percentage detection of these residues was very high. However, a tendency to reduction of P,P′-DDT in mother's milk was noticed since 1971, especially with the unchanged content of P,P′-DDE. Although a reduction of β-BHC in human adipose tissue was noticed, an increase of P,P′-DDE was noticeable. On the whole, there was no detectable difference of the residues in human milk between farmers/non-farmers and primiparity/multiparity.

**77-2623.** Nakamura, Y. ; Tsutsui, J.; Suzuki, H.; Nishikawa, T.; Noda, H. (Lab. Rural Med., Chusei General Hospital, Mie Prefecture, Japan) **[Mercury content of human hair in rural areas of Mie Prefecture.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 316-317; 1977. (Japanese)

The mercury content of hair of persons in several rural villages and a non-rural city was determined during Feb.-June, 1976. Representative average values were 4.6 ± 2.1, 3.9 ± 2.1, 4.0 ± 2.7 and 7.1 ± 4.6 ppm in the rural areas, and 4.3 ± 4.6 ppm in the city. The mercury content of the hair of each individual was determined twice, Feb. 1974 and Feb. 1975; the respective values were 4.9 ± 2.1 ppm and 5.9 ± 2.8 ppm (average of 24 persons). It was found that the consumption of raw and dried fish was heaviest in the area where the highest concentration of mercury was found in the hair of the inhabitants. Only 2 homes in these areas used mercurial pesticide in 1974 and also in 1976. No difference of mercury content of hair was found between younger (20-40 years old) and persons older (50-60 years old). One consistent finding was that the mercury content in hair was higher in men than in women, regardless of their age. It was presumed that the consumption of fish per kg body weight was greater in men, or that the weight of the hair affected the value.

**77-2624.** Roberts, T. R. ; Standen, M. E. (Shell Biosci. Lab., Sittingbourne Res. Cent., Kent ME 8AG, England) **Degradation of the pyrethroid cupermethrin NRDC 149 (± )-α-cyano- 3-phenoxybenzyl (±)-*cis*, *trans*-3- (2,2-dichlorovinyl)- 2,2-dimethylcyclopropane-carboxylate and the respective *cis*-(NRDC 160) and *trans*-(NRDC 150) isomers in soils.** *Pestic. Sci.* 8(4): 305-319; 1977. (5 references)

The degradation of the pyrethroid insecticide cypermethrin and the geometric isomers NRDC 160 (*cis*-) and NRDC 159 (*trans*-) in three soils has been studied under laboratory conditions. Samples of the insecticides labelled separately with $^{14}C$ in the cyclopropyl and benzyl rings were used. The rate of degradation was most rapid on sandy clay and sandy loam soils, 50% of the NRDC 160 and NRDC 159 applied to both soils being decomposed in 4 weeks and 2 weeks respectively. The major degradative route in all soils was hydrolysis of the ester linkage leading to the formation of 3-phenoxybenzoic acid and 3-(2,2-dichlorovinyl) -2,2-dimethylcyclopropanecarboxylic acid; soil treated with the *cis*-isomer (NRDC 160) was found to contain both *cis*- and *trans*-isomer forms of the cyclopropanecarboxylic acid. Further degradation of these carboxylic acids was evident since $^{14}CO_2$ was released from cyclopropyl- and benzyl-labelled cypermethrin in amounts equivalent to 24 and 38% of the applied radioactivity over a 22 week period. A minor degradative route was ring-hydroxylation of the insecticide to give an α-cyano -3- (4-hydroxyphenoxy)benzyl ester followed by hydrolysis of the ester bond. Under waterlogged conditions the rate of hydrolysis of cypermethrin on sandy loam soil was slower than under aerobic conditions and 3-phenoxybenzoic acid accumulated in the anaerobic soil. (Author abstract by permission)

**77-2625.** Walker, A. ; Bond, W. (Nat. Vegetable Res. Station, Wellesbourne, Warwick CV35 9EF, England) **Persist-**

**ence of the herbicide AC 92,553, *N*-(1-ethylpropyl) -2,6,dinitro- 3,4-xylidine, in soils.** *Pestic. Sci.* 8(4): 359-365; 1977. (10 references)

The effects of soil temperature and soil moisture content on the rate of loss of *N*-(l-ethylpropyl) -2,6-dinitro- 3,4-xylidine (I, AC92,553) were measured under controlled conditions. The time for 50% disappearance in a sandy loam soil at 75% of field capacity was inversely related to temperature (98 days at 30°C; 409 days at 10°C). At 25°C, the half-life increased with decreasing soil moisture content (122 days at 75% of field capacity; 563 days at 12.5%). In seven soils with different properties there was a trend towards a slower rate of loss as the organic matter content of the soils increased, and the half-life varied from 72 to 172 days, first-order kinetics being obeyed. The herbicide was lost rapidly from an inert surface, and 97% loss was recorded after 28 days at 25°C. Losses from soil surfaces occurred more slowly and were greater from wet compared with dry soil. In the field, it was more persistent when incorporated than when applied to the soil surface. More than 60% of I incorporated in April 1975 could be detected the following September, but when applied to the soil surface, only about 20% of the applied dose remained by this time. Residues measured by gas-liquid chromatography using a thermionic nitrogen detector closely paralleled those measured by a bioassay based on the root growth of buckwheat. (Author abstract by permission)

**77-2626.** Falandysz, J. (Gdynia, Poland). **Chlorowane weglowodory aromatyczne i ich obesenosc w srodowisku czlowieka. [Chlorinated aromatic hydrocarbons and their occurrence in the human environment.]** *Przem. Spozyw.* 31(8): 307-309; 1977. (16 references) (Polish)

Studies on the toxicity, uses and occurrence in the environment of polychlorinated biphenyls (PCBs) are reviewed. While PCB's are of low toxicity, they are highly persistent, and accumulate in the environment and in the body. PCB residue levels of 0.49, 0.39 and 0.05 mg/kg were found in human tissues, mother's milk, and cow milk, respectively. Residue levels of 2.3-12.7 mg/kg were found in cod liver oil. PCB's are often simultaneously present with organochlorine pesticides and may be mistaken for them during analysis.

**77-2627.** Hansen, R. E. (Water Purification and Pumping, Mt. Clemens, MI) **Experiences with removing organics from water.** *Public Works* 108(10): 78-81; 1977. (4 references)

Difficulties in treating water from Lake St. Clair, Mount Clemens' raw water source, are discussed. Granulated activated carbon (GAC) is the principal filter material used. In the spring of 1976 the Analytical Biochemistry Labs of Columbia, MO, conducted pesticide analyses of the water supply. Heptachlor epoxide, which can be traced to the application of heptachlor or chlordane somewhere in the watershed, was found in the raw water at 600 ppt. After treatment the purified water showed no detectable amounts of these chemicals. Raw water concentrations of 44 ppt benzene hexachloride (BHC) and 5 ppt lindane were also reduced to undetectable amounts in the purified water in this sampling. In subsequent samplings these pesticides and others were detected in the raw water in varying concentrations, but in all cases the concentration of pesticides in raw water met the MCL for pesticides contained in the National Interim Primary Drinking Water Regulations. Analysis of exhausted GAC used from 1968-1971 was used to estimate concentrations of pesticides in the raw water during that time period based on the amount of water filtered. The results are as follows in parts per trillion: DDT 2.3, DDD 3.5, DDE 0.7, Aldrin 1.2, Dieldrin 3.2, Lindane 15.2. Although the GAC filters were installed for taste and odor control, these studies indicate the effectiveness of GAC in removing pesticide formulations.

**77-2628.** Junge, C. E. (Max-Planck-Institute fur Chemie, Mainz, West Germany) **Transport mechanisms for pesticides in the atmosphere.** *Pure Appl. Chem.* 42(1): 89-298; 1975. (16 references)

Transport mechanisms for pesticides in the atmosphere are reviewed. Atmospheric transport of pesticide residues is of basic importance for regional and global distribution of these substances, which is strongly correlated with the residence times of residues in the troposphere. Parameters which determine the residence times of pesticides and polychlorinated biphenyls in the troposphere are discussed. It is important to learn about these residence times, because with short residence times like those of aerosols (approx 1 wk) atmospheric transport and removal processes become very important.

**77-2629.** Association of Chemicals for Forestry (Tokyo, Japan) **[Studies on the fate of herbicides for forestry in soil. Part 6. Results of persistence determination by the plant seed germination method.]** *Ringyo To Yakuzai (Forestry and Chemicals)* 61: 9-13; 1977. (Japanese)

The present data are the results of experiments continued from PART 5. Samples of soil to which 50% sodium chlorate, 4% tetrapion and 15% dalapon were applied on March 24, 1977 were collected on May 23 (8th exp.), July 4 (9th exp.) and Aug. 1 (10th exp.), and seeds of millet wheat and Japanese radish (*Raphanus sativus*) were sown on the soil samples to observe their germination and growth to determine the persistence of the two herbicides. The soil samples were taken at depths of 0-5, 5-10, 10-15 and 15-20 cm from the surface. Two dose levels were used (high and low). The criteria of plant growth were ranked from A to G (slight inhibition of growth to no germination). Results of the 8th experiment showed that no effect of sodium chlorate on seeded plants could be found. However, although the residue concentration of tetrapion and dalapon seemed to decline sufficient amounts remain to affect the seeded plants. Results of the 9th experiment showed that the residues of tetrapion and dalapon became very small; however, the rate of inactivation of these herbicides seemed not to be proportional to the dose rate. Results of the 10th experiment showed that the residues of these herbicides were apparently nil 43 months after application to the soil in the present experiment.

**77-2630.** Marx, J. L. (Author address not given) **Chitin synthesis inhibitors: new class of insecticides.** *Science* 197(4309): 1170, 1172; 1977.

Chemicals which inhibit the synthesis of chitin, a major polysaccharide component of insect cuticles, may be used to control insect populations by killing pests before they reproduce. Although chitin synthesis inhibitors could theoretically have adverse effects on nontarget members of the arthropod phylum, diflubenzuron, the most extensively studied inhibitor, appears to have relatively few adverse effects on nontarget species. It has low short-term toxicity for fish, birds, and mammals, has relatively little tendency to build up in the tissues of higher'animals, and so far has shown no carcinogenicity. Some questions have, however, been raised concerning the persistence of diflubenzuron in the soil, and the compound appears to be highly stable on foliage. The compound can control gypsy moths, certain beetles, flies, mosquitoes, gnats, rust mites, and weevils, but is not effective against cockroaches or ants. Also, since the compound does not kill target insects immediately, it must be applied early in the life cycles of these insects to minimize foliar damage. Application of diflubenzuron at a rate of 0.5-2 oz per acre is effective in controlling susceptible insects. Diflubenzuron may be just the first of a new series of even safer insecticides which act by inhibiting chitin synthesis.

**77-2631.** Buecklers, L. ; Eggensperger, H. (Schuelke u. Mayr GmbH, 2000 Hamburg 63, W. Germany) **Desinfektion und Desinsektion von Vorratsbehaeltern fuer Futtermittel in einem Arbeitsgang. [One-step disinfection and insect control of feed storage containers.]** *Tieraerztliche Umschau* 30(12): 621-628; 1975. (4 references) (German)

The effectiveness, toxicity and persistence of Lysopak and trichlorfon, used in combination for one-step difinfection and insect control in silos and other feed storage containers, were studied. The aldehydes present in Lysopak are oxidized to fatty acids by atmospheric oxygen. In acidic solution, trichlorfon in split into dimethylphosphonate and volatile trichloroethyl alcohol. In alkaline and neutral solution, it metabolized to DDVP, which is further hydrolyzed to dimethylphosphate and dichlorvinyl alcohol, which is further hydrolyzed to dimethylphosphate and dichlorvinyl alcohol, which latter converts to volatile dichloroacetaldehyde. The acute oral $LD_{50}$ of Lysopak is over 1,200 mg/kg in rats, that of trichlorfon is 500-600 mg/kg. The acute dermal $LD_{50}$ of trichlorfon was found to be over 2,000 mg/kg in rats. Trichlorfon is excreted in the urine within thefirst 6 hr. Trichlorfon caused no pathological changes in rats that were feed with 500 ppm trichlorfon for 1 yr.

**77-2632.** Kandasamy, D. ; Marimuthu, T.; Oblisami, G.; Rajukkannu, K.; Raghuraj, R. (Dept. Biol., Tamil Nado Agricultural Univ., Coimbatore, India) **A correlation between the dissipation of insecticides and rhizosphere microflora of *Abelmoschus esculentus* (L.) Moench.** *Zentr. Bakt. Parasitenkd. Infektionskr. Hyg. Abt. 2* 132(4): 340-344; 1977. (16 references)

The relationship between the different groups of microflora and the amount of degraded insecticides in the rhizosphere soil of bhendi (eggplant) var. Lusa sawami is examined in experiments performed at the agricultural farm in Coimbatore. The systemic granular insecticides, aldicarb and disulfoton were applied to furrows at 0.05 and 1.0 kg a.i. per ha at the time of sowing. Both dosages of these insecticides depressed the populations of Azotobacter as well as the fungal population in the rhizosphere as compared with controls. The microbial growth inhibitory effects of these insecticides could be abolished by nutritional factors in the environment. No correlation between the dissipation of these insecticides and the growth of bacteria and actinomycete populations was observed.

**77-2633.** Majka, J. T. ; Lavy, T. L. (Dept. Agron., Univ. Nebraska, Lincoln, NB 68538) **Absorption, mobility, and degradation of cyanazine and diuron in soils.** *Weed. Sci.* 25(5): 401-406; 1977. (19 references)

In the field, surface applied cyanazine 2-[[4-chloro-6-(ethylamino)- triazin-2-yl] amino]-2- methylpropionitrile and diuron [3-(3,4-dichlorophenyl)- 1,1-dimethylurea] did not move below 5 cm in a Monona silty clay loam (Typic Hapludoll) which received 20 cm of water over a 54-day period. In hand-packed soil columns in the laboratory, surface-applied diuron and cyanazine penetrated to depths of 10 and 20 cm, respectively, when leached over a comparable time period and with amounts of water similar to that used in the field. Soil thin layer chromatography and adsorption isotherm studies showed that diuron was adsorbed more strongly than was cyanazine. In general, both compounds were degraded more rapidly at the higher temperatures when incubated at 5, 20, 35, and 50°C over a 20-week period. Degradation was slowest at 5°C in a Valentine loamy fine sand (Typic Ustipsamment). Diuron.appeared to break down most readily at 35°C. Cyanazine was usually decomposed by the 10th week at 5°C and the 5th week at higher temperatures. (Author abstract by permission)

**77-2635.** Radosevich, S. R. ; Winterlin, W. L. (Dept. Environ. Toxicol., Univ. Calif., Davis, CA 95616) **Persistence of 2,4- and 2,4,5-T in Chaparral vegetation and soil.** *Weed Sci.* 25(5): 423-425; 1977. (16 references)

The concentrations of 2,4,5-T [2,4,5-trichlorophenoxy) acetic acid] in four species of vegetation varied from 11 to 115 ppmw immediately after application at 2.24 kg/ha but were less than 0.5 ppmw after 1 yr. The 2,4,5-T level in forest floor declined 90% during the first 6 months after application and less than 0.01 kg/ha remained after 1 yr. There was little leaching of 2,4,5-T from the forest floor into soil and no residues were found deeper than 15 cm. Maximum soil residues did not exceed 0.1 ppmw. Residue levels and dissipation rates of 2,4,5-T were similar after one and two successive annual applications. (Author abstract by permission)

**77-2636.** Matsumura, H. ; Yamamoto, S.; Azakami, N.; Kimoto, T. ((Yamaguchi Prefectural Inst., Hygiene, Yamaguchi, Japan)) **[Hygienic chemical studies on wastes. Part 4. Organochlorine pesticide residues and heavy metals in raw sewage.]** *Yamaguchi-Ken Eisei Kenkyusho Nenpo (Annu. Rep. Yamaguchi Pref. Inst. Hyg.)* 28: 82-83; 1975. (Japanese)

Two series of samples including waste water of defecation collected from 2 Defecating Stations were analyzed for organochlorine pesticide residues. The content of alpha-, beta- and gamma-BHC, dieldrin in accumulated urine and faeces (charged to the defecation process) was 0.0005, 0.0032, 0.0007, 0.0001 and 0.0004 mg/l, respectively. Because of the lack of comparative data, the significance of these present data could not be evaluated. However, these data would be of use in considering human ingestion and excretion of these pesticides.

**77-2637.** Ragotzkie, R. A. (Marine Stud. Cent., Univ. Wisconsin, Madison, WI) **The Great Lakes rediscovered.** *Amer. Sci.* 62(4): 454-464; 1974. (51 references)

During the late nineteenth century major settlement of the Great Lakes region took place. By 1890 wide-scale clearing of the forests occurred and agriculture had begun. Commercial fishing developed mainly for lake trout, whitefish and lake herring. Declining stocks of fish were noted about 1900, and men realized that the resources of the lakes were not without limit. Each crisis of lowered fish stocks was met with man-made research changes, but in spite of the amelioration of some of the problems, the Great Lakes commercial fishery has continued to decline in both quantity and quality. The deterioration of water quality that fishermen and biologists had recognized eventually began to be apparent to people of the cities and towns along the lakes. Industry had long used the lakes as a convenient disposal system for industrial wastes, as had also been done with domestic waste materials. Contamination of the Great Lakes by microcontaminants including heavy metals and organochlorines has originated from natural, industrial, and agricultural sources. DDT levels in Great Lakes fish have declined greatly since the banning of DDT. Since DDT is degraded far more rapidly in bottom sediments than was originally thought, the problem may be nearing a final solution.

**77-2638.** Whitwell, A. C. ; Phelps, R. J.; Thomas, W. R. (Dep. Zool., Univ. Rhodesia, P.O. Box MP167, Salisbury, Rhodesia) **Further records of chlorinated hydrocarbon pesticide residues in Rhodesia.** *Arnoldia (Rhodesia)* 6(37): 1-8; 1974. (8 references)

Raptor eggs were collected from the Gona-re-Zhou area of Rhodesia, as well as other regions in Rhodesia, and analyzed for chlorinated hydrocarbon pesticide residues using electron capture gas chromatography. The South Eastern Lowveld of Rhodesia, of which Gona-re-Zhou is a part, had been extensively treated with pesticides in a campaign against tsetse flies. DDT residues resulting from the spray campaigns were on the order of 500 ppm in the surface bark of the trees sprayed. Veld fires can destroy a considerable amount of the residues accumulated on tree trunks. Analyses of the raptor eggs showed a total DDT residue marginally in excess of 2 ppm in only 1 case, and most eggs contained less than 1 ppm. Eggs from the Buffalo bend region, which is well clear of the sprayed area, contained very low pesticide levels. The tsetse spray campaign may have resulted in low pesticide residues in some birds' eggs, but some of the residues also appeared to have originated from outside the Gona-re-Zhou area. The results show no evidence of a heavy buildup of pesticide residues in the terrestrial environment as a result of anti-tsetse spraying with DDT or dieldrin. Agricultural areas and towns are likely sources of pesticide contamination.

**77-2639.** Newbold, C. (Toxic Chem. Wildlife Sect., Monk Woods Exper. Stn., Inst. Terrestrial Ecol., Huntingdon PE17/2LS, Great Britain) **Herbicides in aquatic systems.** *Biol. Conserv.* 7(2): 97-118; 1975. (61 references)

The object of this paper was to assess whether herbicides are likely to cause long-term, as well as short-term, ecological damage and to review available information about each herbicide used for the control of aquatic vegetation. The characteristics of twelve herbicides: diquat, paraquat, dichlobenil, chlorthiamid, terbutryne, dalapon, diuron, asulam, copper sulfate, maleic hydrazide, maleic hydrazide(2,4-D)-chlorpropham, and 2-4D amine are discussed. The study shows that most herbicides will cause serious declines of both fauna and flora over a short period of time. Long term effects are difficult to assess. The destruction of macrophytes will cause significant changes to aquatic habits for animal life. Recolonization of the original macrophytic flora may occur in time if the ecosystem is allowed to recover and provided the sites from which recolonization may take place are not destroyed. Repeated annual spraying will seriously impair the chances of this happening.

**77-2640.** Dacre, J. C. (Lab. Environ. Med., Tulane Univ. Sch. Med., New Orleans, LA) **Residual organochlorine pesticides in the fat of mutton birds of New Zealand.** *Bull. Environ. Contam. Toxicol.* 11(6): 517-522; 1974. (13 references)

The results of a preliminary investigation of the residual organochlorine pesticide levels in the fat of Mutton Birds of New Zealand are presented. The insecticides *p,p'*-DDE and *p,p'*-DDD, $\beta$-BHC, HEOD, and PCBs were identified in the fat of the birds. The mean levels for six adult birds were: total DDT 17.30 ppm (78% *p,p'*-DDE), *p,p,'*-DDT 1.54 ppm, *p,p'*-DDE 13.50 ppm, *p,p'*-DDD 0.64 ppm, $\beta$-BHC 5.17 ppm, HEOD 0.93 ppm, and PCBs 1.83 ppm. All the compounds found in the adult birds except $\beta$-BHC were also present in a chick bird but in considerably smaller amounts.

**77-2641.** Kamoshita, K. ; Nishizawa, Y. (Res. Dept., Pesticides Div., Sumitomo Chem. Co., Ltd., Takarazuka, Hyogo, Japan) **Thermal decomposition of bis-(*O,O*-dimethylthiono-phosphoryl) disulfide. Part 5.** *Bochu Kagaku (Sci. Plant Protect.)* 39(1): 18-21; 1974. (4 references)

The thermal decomposition of bis-(*O,O*-dimethyl-thiono-phosphoryl) disulfide follows different mechanisms in the presence and absence of water. Without water, the compound decomposed at 102°C, and exothermal decomposition occurred at 170°C. The evolution of decomposition gas took place only gradually, and the main components of the gas were methylsulfide, methyldisulfide, and methanol. In the presence of water, the disulfide started to decompose around 80°C, and the exothermal reaction occurred at 100°C. During the induced exothermal decomposition the temperature inside the reaction vessel rose to above 200°C. Under adiabatic conditions, exothermal decomposition occurred even at 85 °C. Under these conditions the evolution of the gas took place vigorously, and its main components were hydrogen sulfide, methanol and methylmercaptan. The difference in the mode of decomposition according to reaction conditions, suggests that the mechanisms are different. The presence of water may drive the decomposition reaction hydrolytically.

**77-2642.** Markawa, K. ; Shuto, Y.; Miyoshi, Y. (Fac. Agr., Kyushu Univ., Japan) **Thermal decomposition of bis-(*O,O*-dimethyl thionophosphoryl)- disulfide. Part 6.** *Bochu Kagaku (Sci. Plant. Protect.)* 39(1): 21-27; 1974. (14 references)

This paper deals with an investigation of the thermal decomposition of the disulfide, bis-(*O,O*-dimethyl thionophosphoryl) disulfide, under anhydrous conditions. The experiments conducted involved studies of the redox potential, differential thermal analysis, gas produced by the pyrolysis of the disulfide, mass spectrometry of the disulfide, and the change of the disulfide at a relatively low temperature.

**77-2643.** Mikulik, A. ; Vavrova, M. (Nat. Vet. Coll., Brno, Czechoslovakia) **Vliv nekterych technologickych procesu na heptachlor ve veprovem mase [The effect of some technological processes on heptachlor in pork meat.]** *Cesk. Hyg.* 20(6-7); 292-299; 1975. (14 references) (Czech)

Heptachlor was fed to experimental pigs for a period of 10 wk and heptachlor residues were measured in muscle and fatty tissue using TLC. It was determined that heptachlor was metabolized to heptachlor epoxide and deposited mainly in fatty tissue. To assess the effect of food processing, eg. the production of sausages, residues in the contaminated pork were again measured after processing. Smoking, preservation, and broiling of lard caused a several-fold increase in the levels of heptachlor epoxide residues in the pork products. Boiling resulted in a uniform distribution of heptachlor epoxide between the boiled tissue and the broth; in two cases the residues in the boiled tissue declined by 50%. These results indicate that the use of boiling in the processing of pork meat may be an effective means of decreasing heptachlor epoxide residues.

**77-2644.** Szokolay, A. ; Rosival, L. (Nat. Inst. Hyg., Bratislava, Czechoslovakia) **Residues of chlorinated insecticides and life environment in Czechoslovakia.** *Cesk. Hyg.* 20(8): 353-358; 1977. (19 references) (Czech)

The presence of chlorinated pesticide residues (DDT and HCH) in soil, fodder, potatoes, drinking water, eggs, butter, human breast milk, and prepared foods is being studied in four regions of Czechoslovakia. This paper is a preamble to that study and presents a detailed consideration of the sampling and analytical methods to be used in the pesticide survey.

**77-2645.** Jukes, T. H. (Space Sci. Lab., Univ. California, Berkeley, CA) **Comments on the article, "Chlorinated hydrocarbons in the Sargasso Sea atmosphere and surface water".** *Clin. Toxicol.* 7(6): 629-631; 1974. (1 reference)

In this letter to the editor the author refers to an earlier publication discussing the concentration of PCBs and DDT in the air and sea-water. The letter takes exception to the manner in which tabular data is used in the article. The author of the letter stresses that, even if the experimental findings in the article are correct, the calculations with respect to DDT are essentially meaningless, except insofar as they may represent upper limits. It is also stressed that the authors of the original article were not able to detect DDT in subsurface seawater even at the lower limits of the assay procedure, which went down to less than 0.15 ppt. In a second letter to the editor the same author points out again the need for more rigorous editing in the publishing of scientific literature.

**77-2646.** Watkins, D. A. M. (Long Ashton Res. Station, Univ. Bristol, Bristol, BS 18 9AF, England) **Some implications of the photochemical decomposition of pesticides.** *Chem. Ind. (London)* 2(5): 185-190; 1977. (46 references)

A survey of studies of photochemical decomposition of pesticides is presented. Photodegradation studies of dieldrin, heptachlor, DDT, carbamates, phenoxyacetic acids, dichlofluanid, dinitrophenols, dithiocarbamates, and the newer systemic fungicides are described with emphasis on vapor phase work and on breakdown products which are volatile or gaseous. Newer studies investigate the effects of light on pesticides in situ, i.e., in soil, water, and air. The effects of photosensitizers are also being investigated.

**77-2647.** Leard, R. L. (Univ. Southern Mississippi, Hattiesburg, MS) **A study on the use of freshwater pelecypoda as biological monitors of organochlorine pesticides in the major stream systems of Mississippi.** *Diss. Abstr. Inst. B.* 36(8): 3816; 1976.

Various species of freshwater pelecypoda were analyzed for organochlorine pesticides in an effort to determine the value of these organisms as biological monitors of pesticides in the streams of Mississippi. Highest levels were from Yazoo River Basin clams. The study showed that clams were eliminating these pesticides from their tissues. One species of clam, *Corbicula manilensis*, contained the highest residues in 1972. It also showed the most significant reduction

in pesticides in 1973, suggesting it may be the best monitor of pesticides among the species tested. Water samples were also examined. Mirex residues were analyzed in clams for twelve sites in Mississippi streams and were detected at only three. A study was also conducted to determine if clams concentrated pesticides to differing degrees in four general types of tissues. *Lampsilis* and *Plectomerus* showed similar distributions of the residues. *Corbicula* also showed highest concentrations in the visceral mass, followed by the gill, foot, and mantle. In *Quadrula*, the highest levels were noted in the gill, followed by the visceral mass, mantle, and foot. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 76-4451.)

**77-2648.** Harvey, G. R. ; Miklas, H. P.; Bowen, V. T.; Steinhauer, W. G. (Woods Hole Oceanographic Inst., Woods Hole, MA 02543) **Observation of the distribution of chlorinated hydrocarbons in Atlantic Ocean organisms.** *J. Mar. Res.* 32(2): 103-118; 1977. (27 references)

To study the distribution of chlorinated hydrocarbons in Atlantic. Ocean biota several species of organisms were collected from the open Atlantic Ocean between 66 N and 35 S latitude, specimens were prepared, residues extracted, and measurements were made using a GLC technique. All organisms had higher concentration of PCB' than t-DDT (DDT, DDD, DDE). No evidence was found for food chain magnification of the pesticide residues from samples taken from various trophic levels. Mixed plankton contained 200 μg/kg PCB, more than any other class of gilled organism in the Atlantic. Mesopelagic organisms presented with concentrations of PCB and t-DDT well below those found in mixed layer organisms, but 10 fold less than those found in pelagic species. No horizontal concentration gradient were discernible within the plankton or mesopelagic data. The concentration ratios of PCB to t-DDT were determined to be approximately 30/1 in the marine atmosphere, surface water, and plankton, but decreased to about 3/1 in high predators and mid-water organisms. These results indicate that PCB and t-DDT, although similar in structure, move differently through the marine environment.

**77-2649.** Findlay, G. M. ; Howe, G. J.; Lockhart, W. L. (Dept. Entomol., Univ. Manitoba, Winnipeg, Manitoba, Canada) **Impact of fenitrothion upon Japanese quail (*Coturnix Japonica*) in a forest ecosystem.** *Manitoba Entomol.* 8(2): 10-15; 1977. (14 references)

Field studies are presented which assess the effect of fenitrothion upon Japanese quail caged in the parkland region of south central Manitoba which was sprayed with fenitrothion to control the spruce budworm *Choristonerua fumiferana*. The fenitrothion was applied aerialy at 4 oz a.i. per acre. Residues were detected in crop contents at 0.06 to 1.9 ppm and in quail carcasses at 0.007 to 0.24 ppm 8 hr after spraying, 5 day after spraying the residues were undetectable. Serum cholinesterase activity declined 62.5% at 8 hr and returned to normal 5 days postspray; brain cholinesterase activity declined 13% but did not return to normal after 5 days. Quail caged under the spruce canopy were somewhat protected, and brain cholinesterase activity was significantly inhibited in only one of three pens.

**77-2650.** Kveseth, N. J. (Inst. Farmakol. Toksikol., Norges Veteriknaerhogskole, Oslo, Norway) **Organochlorine insecticides and PCB's in cod from Norwegian fjords.** *Nords Veterinaermed.* 28(3): 170-176; 1976. (28 references) (Norwegian)

To assess contamination of cod, cod livers from fish collected at 21 different locations in the Norwegian fjords were analyzed by GLC for PCB and chlorinated pesticide residues. All samples contained DDT, DDE, DDD, and PCB. PCB concentrations ranged between 0.3 and 3.9 ppm, wet weight, and DDT levels were between 0.2 and 25 ppm. The highest levels of DDT contamination were found in cod taken from areas near fruit orchards, while cod taken from areas near forest nurseries presented average levels of DDT contamination.

**77-2651.** Siyali, D. S. ; Wilkey, I. S.; Parkinson, A. D. (Div. Anal. Labs., Health Commission of New South Wales, Australia) **Organochlorine pesticide residues in human fat samples from Papua New Guinea.** *Papua New Guinea Med. J.* 17(1): 111-115; 1974. (8 references)

Organochlorine pesticide residues in human fat samples taken from Papua New Guinea are reported. All samples contained DDT. In Papua New Guineans, the level of DDT was on the average slightly higher than in European samples. There was, however, a much wider range of levels in Papua New Guineans. Other organochlorine insecticides, including dieldrin, were present in some samples, but the differences in levels between the indigenous and European populations in Papua New Guinea were not significant. In two thirds of the samples from Papua New Guinea, hexachlorobenzene was detected. This chemical was also detected in all samples from Europeans. The mean level and the range of levels of HCB were much lower in Papua New Guineans than in Europeans.

**77-2652.** Petrocelli, S. R. ; Anderson, J. W.; Hanks, A. R. (Bionomics Marine Lab., Box 1002, Pensacola, FL 32507) **Seasonal fluctuations of dieldrin residues in the tissues of the marsh clam, Rangia cuneata, from a Texas estuary.** *Texas J. Sci.* 31(3-4): 443-448; 1975. (23 references)

Seasonal fluctuations of dieldrin residues were studied in the tissues of the marsh clam, *Rangia cuneata*, from a Texas estuary. *Rangia* collected from Trinity Bay in October and December of 1970 had lower residues of dieldrin than those collected in February, April, and July 1971. The mean for October and December were 7.9 and 6.8 ppb, respectively, or at least twice the October/December values. Possible explanations for seasonal fluctuations of insecticide residues in the tissues are discussed.

**77-2653.** Hawk, R. E. ; Sheets, T. J.; Cassil, C. C.; Fullmer, O. H.; Fujie, G. H.; McCarthy, J. F. (FMC Corp., Agric. Chem. Div., Middleport, NY 14105) **Effect of application method on the transfer of carbofuran and 3-hydroxycarbofuran into cigarette mainstream smoke.** *Tobacco* 178(1): 32-34; 1976. (7 references)

The transfer of carbofuran and 3-hydroxycarbofuran into cigarette mainstream smoke from residues in field-treated and artifically treated tobacco was investigated. Ten cigarettes were smoked at a time on a smoking machine and the condensate from ten batches was combined to give condensate from 100 cigarettes per sample. Cigarettes were 70 mm long before smoking and were smoked to a length of 23 mm. The study showed that the percent transfer of carbofuran and 3-hydroxycarbofuran into the smoke of field-treated tobacco was much less than that from artifically spiked tobacco. Carbofuran appears to be transferred to the mainstream smoke more readily than 3-hydroxycarbofuran. The amount of carbofuran transferred to the smoke is more than twice the amount of 3-hydroxycarbofuran transferred from tobacco with comparable residue levels. Maximum combined residues of 73 ppm were noted in one sample of tobacco field-treated at the maximum registered rate of 6.7 kg/ha. The commercial use of carbofuran is not expected to result in detectable residues in tobacco smoke.

**77-2654.** Goering, C. E. ; Butler, B. J. (Agric. Eng. Dep., Univ. Missouri, Columbia, MO) **Micrometeorological measurements for pesticide drift studies.** *Trans. ASAE* 17(6): 1104-1107; 1974. (9 references)

The development of a weather instrumentation system for use in pesticide drift studies is reported. A general discussion of the system is offered with specific details on the following points: sensors for air temperature difference; wind sensors; measurement of atmospheric pressure, air temperature, and relative humidity; wind profiles; and stability indicators. The weather instrument system as described for this study was of moderate cost, about 1500, not including the strip chart recorder. Measurements from the system appeared reasonable, consistent, and in agreement with generally accepted micrometerological theory.

**77-2655.** Burwell, R. E. ; Schuman, G. E.; Piest, R. F.; Spomer, R. G.; McCalla, T. M. (U.S. Dep. Agric., North Central Watershed Res. Ctr., Council Bluffs, IA 51504) **Quality of water discharged from two agricultural watersheds in Southwestern Iowa.** *Water Resour. Res.* 10(2): 359-365; 1974. (15 references)

A two year study was conducted on a diversified level-terraced watershed and a contour-planted corn-cropped watershed. The study showed the benefit and necessity of using a well-planned conservation management system to reduce surface runoff, erosion, and discharge of agricultural chemicals capable of degrading surface water. Quantities of water, sediment, nitrogen, and phosphorus discharge from the level-terraced watershed were low because of the effective control of surface runoff and erosion. The quality of water discharged from the 157.5 ha water shed was within acceptable limits for potable water except for the levels of ammonia, inorganic phosphorus, and coliform. Nutrient concentration was high occasionally, but the nutrient quantities discharged were low, thus showing the effectiveness of the level-terrace system in controlling surface runoff and erosion. Atrazine residue in the runoff and sediment was detected in only one sample. None of the several chlorinated hydrocarbons and organophosphate compounds applied to the watershed was detected in runoff or sediment.

**77-2656.** Schulz, H. D. (Abt. Allgemeine und Kommunalhygiene, Med. Akad. Magdeburg, Germany) **Pest Control in the Hospital and Insecticide Residues Z.** *Gesamte Hyg. Ihre Grenzgeb.* 23(7): 472-474; 1977. (14 references) (German)

Pest control is discussed as it is used in hospitals and the insecticide residues it leaves. Samplings of dust in the buildings of a clinin have shown considerable DDT residues. The residues varied between 4 and 235 milligrams of DDT for every 100 grams of dust. The concentration of the residues found depended on the frequency of application. Air samples taken from basement rooms revealed values of 10 to 12 micrograms per cubic meter, which constitute saturation concentrations for that compound. On the ground floor the concentration of DDT in the air showed an average of 1.2 micrograms per cubia meter. It has been shown to be useless to maintain a constant insecticide coating, as it only permits the development of resistance. It also leads to a large degree of air pollution with poisons which lasts for many years and even decades. It is suggested that pests be combated by means of adequate, specific acting agents, taking into account the living habits of the pests in question.

*see also* 77-2669 77-2766 77-2775 77-2803 77-2820 77-2824

**77-2657.** Wolf, A. F. (Scott and White Clinic, Temple, TX 76501) **Occupational diseases of the lung. Part III. Pulmonary disease due to inhalation of noxious gases, aerosols or fumes.** *Ann. Allerg.* 35: 165-171; 1977. (98 references)

Symptoms, sources, and diagnoses of respiratory diseases caused by gases and aerosols of nitrogen oxides, sulfur dioxide, phosgene, polyurethanes, Bakelite, cadmium, zinc chloride, zinc oxide, mercury, manganese oxide, nickel carbonyl, lipids, chloromethyl methyl ether, perchloroethylene, and the insecticides toxaphene and parathion are discussed. Parathion, which can be absorbed through the skin, may cause pulmonary edema, muscle twitching especially of the diaphragm, and weakness. The mode of action is thought to be through inhibition of esterase activity, and the antidote is atropine. Toxaphene inhalation can cause extensive bilateral bronchopneumonia which lasts about three days; radiologic symptoms disappear in about three weeks.

**77-2658.** Taylor, A. ; Marks, V. (Dept. Biochem., Univ. Surrey, England) **Diagnostic value of urine mercury measurements.** *Ann. Clin. Biochem.* 14(5): 297-300; 1977. (12 references)

To assess problems associated with the diagnosis of mercury toxicity in the absence of known exposure a review of referrals to a regional heavy metals center for possible mercury poisoning was made. Specimens received from 77 patients represented aliquots of 24 hr urine collections, while there were random specimens from 44 patients. Mercury was measured by cold-vapor atomic absorption spectrophotometry after overnight digestion with sulfuric acid-potassium permanganate. This review indicates that at least 2 cases of suspected mercury poisoning per year will be seen at a typical hospital serving a quarter of a million people. Potentially harmful exposure to mercury was proven in 20% of the suspected cases. The measurement of urinary mercury, as illustrated in this report, is indicated whenever certain clinical symptoms are present, even in the absence of a history of exposure to mercury.

**77-2659.** Sherwood, M. J. ; Mearns, A. J. (Southern California Coastal Water Res. Project, El Segundo, CA 90254) **Environmental significance of fin erosion in southern California demersal fishes.** *Ann. NY Acad. Sci.* 298: 177-189; 1977. (22 references)

Information from various studies on the causes of fin erosion in the Dover sole, *Microstomus pacificus* (Lockington) is summarized. The primary study area extended along the Southern California coastline from Oxnard in Ventura County to Point Loma in San Diego County. Collection studies, aquarium studies, and regional studies on the sources and distribution of chlorinated hydrocarbon and trace element contaminants comprise the project. Initial measurement of contaminants in fin samples of sole taken from the most highly contaminated region of the Palos Verdes shelf revealed the following concentrations in mg/kg dry weight: total DDT, 120-140; total polychlorinated biphenyls, 6.0-9.0, cadmium, 56-64; chromium, 930-1000; copper, 500-550; lead 370-380; zinc, 1600-1900. The fins most frequently affected were those most often in contact with bottom sediments. These studies suggest that fin erosion in *M. pacificus* is caused by exposure to contaminated sediments and that the role of chlorinated hydrocarbons should be tested directly in future experiments.

**77-2660.** Mearns, A. J. ; Sherwood, M. J. (Southern California Coastal Water Res. Project, El Segundo, CA 90245) **Distribution of neoplasms and other diseases in marine fishes relative to the discharge of waste water.** *Ann. NY Acad. Sci.* 298: 210-224; 1977. (37 references)

This study was based on an examination of approximately 290,000 fishes from 151 species collected from southern California coastal waters from 1969 to 1976. Selected fish were examined histologically, and trace contaminant studies were performed. Approximately 5% of the fish examined were affected with external disease symptoms including fin and tail erosion, tumors, abnormal coloration, and attached macroparasites. Fin erosion in Dover sole (and several other species to a lesser extent) is the only disease that appears to be directly associated with discharge of municipal waste waters in southern California. Many fish with fin erosion caught at Palos Verdes had over 5 ppm DDT in the muscle tissue and are unfit for human consumption. Tumor diseases discussed in this report did not correlate with single municipal waste discharge sites or to other discrete sources of pollutants. Examination of specimens from the Palos Verdes site suggests that the high levels of chlorinated hydrocarbons found in the tissues of fish caught there are inimical to the parasite *P. cincinnatus* and possibly to other macroparasites as well.

**77-2661.** Falkmer, S. ; Marklund, S.; Mattsson, P. E.; Rappe, C. (Dep. Pathol., Univ. Umea, Umea, Sweden) **Hepatomas and other neoplasms in the Atlantic hagfish ( *Myxine glutinosa*): a histopathologic and chemical study.** *Ann. NY Acad Sci* 298: 342-355; 1977. (20 references)

Cyclostomes, particularly the hagfish, caught in the Gullmar Fjord, Sweden, were studied over a five year period for the occurrence of tumors. Hepatomas, the predominant neoplasm, decreased from 5.8% in 1972 to 2.9% in 1973, and to 0.6% in the 1974-1976 studies. Hepatomas in hagfish caught in the open seas 12 km from shore decreased from 2.8% in 1972 to 0.9% in 1974. Islet cell hamartomas and frank neoplasms also decreased from 0.5% in 1972 to less than 0.1% in 1973-1976. Subcutaneous and mesenterial neoplasms were occasionally observed during the same time period. Pollution in the Gullmar Fjord by carcinogenic substances such as PCBs, DDT, DDE, and DDD is postulated as the cause of the tumors. Analyses for PCBs, DDT, and aflatoxins were performed by thin-layer chromatography and gas chromatography. Livers from the hagfish caught in the fjord contained 5 mg/kg wet weight of PCB and 0.1-0.4 mg/kg (dry weight) of DDT, DDD, and DDE, while the open sea hagfish livers contained only 0.2 mg/kg (wet weight) of PCB. It is suggested that the diet is responsible for the con-

centrations of PCB, DDT, DDD, and DDE found in the hagfish.

**77-2662.** Overstreet, R. M.; Howse, H. D. (Parasitol. Sec., Gulf Coast Res. Lab., Ocean Springs, MS 39564) **Some parasites and diseases of estuarine fishes in polluted habitats of Mississippi.** *Ann. NY Acad. Sci.* 298: 427-462; 1977. (95 references)

Several diseases that afflict both finfishes and shellfishes that live in estuarine waters of the Mississippi as a result of suspected or known pollution of those waters are surveyed. Residues of chlordane (0.73 ppm), endrin (1.02 ppm), and DDT (3.11 ppm) were found in tested striped mullet livers. The American oyster was monitored for pesticides monthly for approximately 7 yr from eight stations, and Mississippi ranked 13th out of 15 coastal states in DDT levels (135 ppb) and 14th for dieldrin. The pesticide concentrations are low enough in the Mississippi so that under most conditions they will not trigger pathological conditions. Further study is needed to identify the relationships between chemical stress and diseases as well as chemical neoplasia, and to demonstrate possible synergistic effects between pesticide residues and other forms of pollution.

**77-2663.** Upholt, W. M. (Office of Water and Hazardous Materials, U.S. EPA, Washington, D.C. 20460) **Philosophies of the Environmental Protection Agency in regulating human exposure to carcinogens.** *Ann. NY Acad. Sci.* 298: 583-586; 1977.

Problems associated with and rationale behind the philosophy of the U.S. EPA in regulating human exposure to carcinogens is discussed. The pesticides DDT, dieldrin, and heptachlor, which are among the compounds that the EPA has taken strong action against as suspected or proven carcinogens are used as examples of EPA practice. Questions raised in the CBS television special "Politics of Cancer" in June 1976 are considered. The recently announced EPA interim procedures for regulation suspected carcinogens are discussed. The EPA may use both the Federal Food, Drug, and Cosmetic Act and the Federal Insecticide, Fungicide, and Rodenticide Act to regulate pesticides.

**77-2664.** Lande, S. S. (Allegheny County Health Dept., Arsenal Health Cent., Pittsburgh, PA 15224) **An epidemiological study of pesticide exposures in Allegheny County, Pennsylvania** *Arch. Environ. Health* 29: 90-95; 1974. (32 references)

Pesticide incidents reported to the Pittsburgh Poison Center were followed up with a standard interview. Comparison of the statistical evaluation of these interviews with other regional and national studies indicated that the Allegheny County experience is representative of accidental pesticide exposures in an urban area. Remarkably high frequencies were observed for children less than 2 years old exposed to attractive formulations, for children of 2 to 5 years exposed to stored products, and for adults exposed during applications. Seasonal differences were also noted. Childhood exposures, especially to rodent and ant baits, were often unnecessarily treated. (Author abstract by permission)

**77-2665.** Baker, J. R. (Clin. Pathol. Unit, Dep. Vet. Pathol., Univ. Liverpool, Leahurst, Neston, Wirral, England) The results of post-mortem examination of 132 wild birds. *Br. Vet. J.* 133(4): 327-333; 1977. (18 references)

Post mortem bacteriological and histological examinations and chemical assays were performed on 132 wild birds representing 33 species; all had been found dead or dying. The cause of death was infectious illness in 33% of the birds, poisoning in 27%, traumatic injury in 16%, severe parasitic infectation in 2%, other miscellaneous causes in 13%, and cause unknown in 9%. Of the poisoned birds, 12 died after exposure to chlorine gas at an industrial plant, 8 died after exposure to an unknown agent sprayed by helicopter on a corn crop, 12 died of possible mercury poisoning in a recently sown field, 1 died of $\alpha$-chloralose poisoning, and 2 died of strychnine poisoning. Most of the poisoned birds were part of larger populations which had been similarly poisoned. Since such mass deaths attract attention, it is likely that the incidence of poisoning among the birds examined in this study is higher than the incidence in the avian population as a whole.

**77-2666.** Corbett, T. H. (U.S. Vet. Admin. Hosp., Ann Arbor, MI) **Occupational Cancer.** *In: Cancer and Chemicals, Nelson-Hall, Chicago* 25-54; 1977.

Occupational exposure to known and suspected carcinogens has been, and continues to be, investigated by the National Insstitute for Occupational Safety and Health (NIOSH). The function of NIOSH is to research and publish criteria documents for industrial exposure situations to provde a basis for the development of adequate protective measures. Occupational exposure to coke oven emissions, asbestos, bis(chloromethyl)ether, vinyl chloride, trichloroethylene, benzene, chloroprene, formaldehyde, wood and wood products, ethylene dibromide, arsenic, kepone are discussed in this paper.

**77-2667.** Grier, J. W. (Zoology Dept., North Dakato State Univ., Fargo ND 58102) **Reproduction, organochlorines, and mercury in Northwestern Ontario Bald Eagles.** *Can. Field Natur.* 8(4): 469-475; 1977. (53 references)

To assess the potential importance of various toxic chemical to the reproduction of birds of prey, 8 yr (1966-1973) of reproduction data of Bald Eagles in northwestern Ontario were studied together with a limited amount of toxicant data. During this period, there appeared a significant decline ($p < 0.05$) in the percentage of potential breeding areas that actually produced nestlings, but the average number of young per nest (1.5) did not decline. High levels of *p,p'*-DDE-- 94 ppm, dieldrin -- 5.2 ppm, PCB -- 434 ppm, and mercury -- 2.5 ppm were observed in added eggs, and these eggs were significantly thinner ($p < 0.05$) than similar eggs

collected before 1947. Although no direct cause effect relationship has been demonstrated, this study suggests that organochlorine residues are responsible for the lowering of the reproductive rate of Bald Eagles in northwestern Ontario.

**77-2668.** Anonymous **EPA criticized for pesticide ban process.** *Chem. Eng. News* 55(39): 22; 1977.

The U.S. EPA is criticized for its rebuttable presumption against registration (RPAR) policy. An RPAR is a ruling that the EPA can make against the continued use of a pesticide when the agency feels that the compound poses a significant environmental threat. The toxaphene controversy which involved the cotton industry and the Hercules chemical company is presented as evidence of the problems with RPAR.

**77-2669.** Ahling, B. ; Lindskog, A.; Jansson, B.; Sundstrom, G. (Swedish Water and Air Pollution Res. Lab., Stockholm, Sweden) **Formation of polychlorinated dibenzo-*p*-dioxins and dibenzofurans during combustion of a 2,4,5-T formulation.** *Chemosphere* 6(8): 461-468; 1977. (16 references)

The combustion of a standard 2,4,5-T formulation under simulated environmental conditions led to the formation of small amounts of polychlorinated dibenzo-*p*-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF). Under combustion temperatures exceeding 500°C, the 2,4,5-T ester was 99.995% destroyed, a notably high concentration of free 2,4,5-trichlorophenoxyacetic acid resulting. The role of free 2,4,5-trichlorophenoxyacetic acid in the formation of PCDD and PCDF is not clear. The emission of PCDD decreased with increased temperature and transit time; the greatest emission (3 mg of CDD per kg of formulation) occurred at 500°C. Up to 8 mg PCDF was formed per kg of formulation, but no correlation was found with temperature or transit time. The concentration of the 2,4,5-T ester in the burned material was higher than the concentration found in the environment after normal use, and a high concentration favors the formation of dimers. Although smaller amounts would be expected to result from, say, a forest fire in the environment, extreme caution is required to avoid dissemination of these highly toxic xenobiotics.

**77-2670.** Rudner, E. J. (23077 Greenfield Rd., Suite 335, Southfield, MI 48075) **North American group results.** *Contact Dermatitis* 3(4): 208-209; 1977. (2 references)

A battery of patch tests was given to 900-2000 patients during the period July 1, 1975 to June 30, 1976. The study was conducted by the North American Contact Dermatitis Group, and the tests were read at 48 and 96 hr. The tests were conducted using a variety of allergens, including perservative and perfume allergens. The results with the preservative and perfume allergens were preliminary and, in some cases, incomplete. A high reactivity toward 1% captan was observed, which may be related to thiram reactions. No satisfactory explanation of its high reactivity has been found.

**77-2671.** Van Ketel, W. G. (Dep. Dermatol., Free Univ. Hosp. Postbo 7057, Amsterdam 1011, The Netherlands) **Sensitivity to the pesticide benomyl.** *Contact Dermatitis* 2(5): 290-291; 1977. (1 reference)

Methyl-*N*-1- (butylcarbamoyl)- benzimidazole -2- ylcarbamate (benomyl), a compound used mainly against mildew, can cause contact sensitivity in persons picking plants treated with the pesticide. Patch testing of a 31 yr-old grower demonstrated the benomyl was the cause of the hand eczema from which he had been suffering for 2 yr. This condition may be similar to that seen from plondrel which has been previously reported in the literature.

**77-2672.** Selby, L. ; Case, A. A.; Osweiler, G. D.; Hayes, H. M. (Coll. Veterinary Med., Univ. Missouri, Columbia, MO 65201) **Epidemiology and toxicology of arsenic poisoning in domestic animals.** *Environ. Health Perspect.* 19: 183-189; 1977. (20 references)

A review of the basic toxicology of arsenic intoxication in animals and an evaluation of the medical records from 13 North American veterinary colleges from 1964 to 1974 as well as selected data collected by authors in field investigations of suspected intoxication outbreaks in cattle and later documented as arsenic poisoning are presented. Dogs and cattle are intoxicated more frequently than other animals. Acute intoxication is the most common form of arsenic intoxication observed in dogs, especially younger dogs aged 2-6 mo. Arsenic is a severe alimentary tract irritant in domestic animals, and treatment usually consists of symptomatic and supportive therapies. Dips, sprays, powders, or vegetation contaminated by pesticides are the most frequent causes of arsenic intoxication. The monitoring of domestic animals with a history of arsenic intoxication may offer clues to environmental hazards yet unknown to humans.

**77-2673.** Boiko, I. B. (Uzbek Scientific Research Institute of Hygiene and Occupational Diseases, Tashkent, USSR) **Materialy k gigienicheskomu obosnovaniiu predel'no dopustimoi kontsentratsii bazudina v vode vodoemov. [Materials to substantitate the MAC level of basudin (diazinon) in water bodies.]** *Gig. Sanit.* (8): 105-107; 1977. (Russian)

The general hygienic and toxicological properties of diazinon in water were studied to establish the maximum allowable concentration of this pesticide in water bodies. The smallest concentration to impair the organoleptic properties of water was 0.39 mg/liter. When added to water in concentrations of 0.6, 6 and 60 mg/liter, diazinon was detectable for 16, 21 and 35 days, respectively. Diazinon reduced the BOD, level by 40% compared to the control, while a concentration of 60 mg/liter increased the $BOD_{20}$ value to 140%. Diazinon had no effect on the bacterial flora of the water, but at the concentration of 0.6 mg/liter it interfered with ammonification and nitrification processes. The acute oral $LD_{50}$ values were found to be 240 mg/kg for albino rats and 370 mg/kg for rabbits. Negligible cumulative effect was observed. Rats and rabbits were fed daily 0.6-7.4 mg/kg doses for 10 months to determine the chronic toxicity of diazinon.

The smallest doses that caused significant changes in the cholinesterase activity were 0.48 mg/kg for rats and 0.9 mg/kg for rabbits. The findings indicate that the MAC value of diazinon in water bodies should be set at 0.3 mg/liter.

**77-2674.** Kundiev, Yu. I. ; Mamsikov, A. Z.; Bolsunova, L. Ya. (Inst. Occup. Hyg. Indust. Med., Kiev, USSR) **Osnovnye itogi issledovanii po gigiene i fiziologii truda v sel'skokhoziaistvennom proizvodstvi i zadachi v svete reshenii 25 s'ezea KPSS [Results of studies concerning work hygiene and physiology in agriculture.]** *Gig. Tr. Prof. Zabol.* 5: 1-7; 1977. (8 references) (Russian)

Results of studies dealing with occupational hygiene and physiology in agriculture and the objectives resolved in this connection at the 25th Congress of the Soviet CP are given. The physical, chemical, biological and other adverse factors which affect humans are enumerated. Results of studies dealing with cardiovascular and sympathicoadrenal systems in relation to occupation are presented. Various clinical and physiological studies have helped to identify and clarify the source and extent of harmful conditions and activities connected with work and environment. Better designed and built machines are expected to improve the working conditions of the farmer.

**77-2675.** Gehlbach, S. H. ; Williams, W. A.; Woodall, J. S.; Freeman, J. I. (North Carolina Dept. Human Resources, Pesticides Program, Div. Health Services, Raleigh, NC) **Pesticides and human health - an epidemiologic approach.** *Health Serv. Rep.* 89(3): 274-277; 1974. (4 references)

The North Carolina Pesticide Program which began in January of 1969 is described. The major activities of the program include the investigation of acute poisonings, community usage studies, occupational exposure monitoring, information service, and legislation and control. During 1970 a voluntary pesticide poisoning reporting system was started. The program publishes monthly newsletters and poison control notes which supply physicians with up-to-date information, including treatment advice, about morbidity patterns which occur throughout the State. Cases of accidental exposure through carelessness around the home and carelessness about re-entry into fields are described. Occupational exposure is considered.

**77-2676.** Fisher, J. R. (Phoenix Indian Med. Cen., Phoenix, AZ 85016) **Guillain-Barre syndrome following organophosphate poisoning.** *J. Am. Med. Assoc.* 238(18): 1950-1951; 1977. (8 references)

A case of organophosphate-induced delayed neurotoxicity by the widely used cotton defoliant merphos is described. A 28-yr-old man working with the defoliant accidentally splashed the chemical on his bare arms over a period of 3 days. Four days after exposure he noted that his hands and arms were weak. After further deterioration in his condition but without signs of acute intoxication, he was admitted to a hospital and treated for presumptive organophosphate poisoning. He received atropine, 4.0 mg i.v., and pralidoxime chloride, 1.0 g i.v. immediately, and 10 mg atropine and 1.0 g pralidoxime chloride subsequently, but his condition worsened. Fourteen days after initial exposure he was virtually completely paralyzed, but vital capacity, arterial blood gases, plasma cholinesterase activity, and other pertinent laboratory data were normal. Electromyography demonstrated decreased voltage of muscle action potentials, delayed conduction velocity in motor nerve fibers, increased insertional activity, and denervation potentials. An intensive program of physical therapy was undertaken for 6 wk; 14 wk later he had recovered completely. Physicians practicing in agricultural areas must consider exposure to organophosphate pesticides in the differential diagnosis of polyradiculitis of delayed onset. The need for adequate instruction and supervision of persons handling these chemicals is evident.

**77-2677.** Brown, L. D. ; Dorn, C. R. (Webb Air Force Base, TX 79720) **Fish, shellfish, and human health.** *J. Food Protect.* 40(10): 712-717; 1977. (38 references)

Illness resulting from ingestion of contaminated fish food products is discussed. One source of fish contamination is pesticide pollution. Although no cases of chronic or acute pesticide toxicity resulting from the ingestion of fish has been reported, the potential for poisoning exists. Some compounds such as DDT are magnified in the food chain, and may be stored in human fat and excreted slowly. Blood levels of endrin 2000x higher than the ambient level have been reported in catfish grown on fish farms in cotton growing areas. Fish and shellfish borne illness in man can be avoided by eating only fish caught in unpolluted waters, cooking fish thoroughly, and varying the diet.

**77-2678.** Brady, J. ; Liberatore, F.; Harper, P.; Greenwald, P.; Burnett, W.; Davies , J. N. P.; Polan, A.; Vianna, N.; Bishop. M. (Bur. Occup. Health. Chron. Dis. Res. New York State Dept. Health, Empire State Plaza, Tower Bldg, Albany, NY 12208) **Angiosarcoma of the liver: an epidemiologic survey.** *J. Natl. Cancer Inst.* 59(5): 1383-1385; 1977. (17 references)

This study evaluates the correlations between the incidence of angiosarcoma of the liver (ASL) and exposure to thorium dioxide ($THO_2$) As, (used both in pesticides and as a drug) and vinyl chloride (VC) in a geographically based population. A case-control study indicated that $THO_2$ and VC were significantly important factors (p 0.02) in the etiology of ASL. Direct exposure to these compounds could not be established for 19/26 study patients with ASL; however, 5 out of the aforementioned 19 study patients lived nearer to VC plants than did matched controls. This observation indicates that hazards associated with certain occupations extend beyond the industrial plant.

**77-2679.** Peterson, R. G. ; Rumack, B. H. (Div. Clin. Pharmacol., Univ. Colorado Med. Ctr. Denver, CO 80262) **D-Penicillamine therapy of acute arsenic poisoning.** *J. Pediat.* 91(4): 661-666; 1977. (28 references)

Three cases of solubilized arsenic trioxide poisoning in Navaho Indian children and one case of sodium arsenate ingestion in an infant are reported. Three children were successfully chelated with D-penicillamine (D-p),, administered in four daily doses, 25 mg/kg/dose, orally following ingestion of soluble arsenicals. Measurements of urinary excretion patterns of arsenic during therapy indicate that D-p is at least as effective as intramuscular dimercaprol. No relapse in symptoms was observed following the course of treatment, and no further arsenic could be mobilized by giving dimercaprol, i.m., or further D-p. Plasma homeostatis of zinc, copper, calcium, and magnesium was maintained during D-p therapy without supplementation. D-p should be considered an effective agent in the treatment of acute arsenic intoxication whenever oral administration is considered safe; dimercaprol should be administered i.m. when oral dosing is not possible.

**77-2680.** Simpson, G. R. ; Bermingham, S. (Agric. Health Sec., Div. Occup. Health Radiat. Contr. P.O. Box 163, Lidcombe, New South Wales, 2141 Australia) **Poisoning by carbamate pesticides.** *Med. J. Aust.* 2(5): 148-149; 1977. (5 references)

Some of the newer carbamate pesticides in use have cholinergic properties similar to those of the organic phosphates, although of shorter duration. The newer and more toxic carbamates, i.e., methomyl, aminocarb, bendiocarb, methiocarb, and promecarb, inhibit both RBC and plasma cholinesterase activity; the older type generally inhibited only plasma cholinesterase. The period of inhibition of the cholinesterases is approximately 1-2 hr, and recovery usually occurrs between 24 and 48 hr after contact. Atropine administration is the treatment of choice. Blood samples should be taken as early as possible and tested immediately to obtain meaningful cholinesterase values. The Ellman method or some other rapid cholinesterase assay is recommended because the enzyme will regenerate spontaneously during the 1 hr incubation period required for the Michel method.

**77-2681.** Wechsler, A. E. ; Harrison, J. E.; Neumeyer, J. (Arthur D. Little, Inc., Cambridge, MA) **Evaluation of the possible impact of pesticide legislation on research and development activites of pesticide manufacturers.** *Natl. Tech. Inform. Serv.* PB-245,023, 124 p.; 1975.

The report discusses research and development activities of pesticide manufacturers as R and D is affected by pesticide legislation. It deals with trends in the pesticide industry and the R and D process and decision making, product development, and innovation. It compares the Federal Insecticide, Fungicide and Rodenticide Act with the Federal Environmental Pesticide Control Act and notes specific and general impacts of legislative and regulatory actions. It also makes recommendations to reduce adverse effects of FEPCA implementation.

**77-2682.** Noda, K. ; Konishi, Y.; Uchida, A.; Nomura, S.; Sugano, J.; Ebihara, I.; Miyamoto, A.; Izumi, S.; Ueda, A.; Umishio, K.; Kozu, M.; Sasaki, S.; Isomura, K.; Kameyama, K.; Kambe, Y. (Saku General Hospital, Saku, Nagano, Japan) **[Studies on respiratory impairment (including farmers' lung disease) caused by farming procedures.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 204-205; 1977. (Japanese)

Results of studies during the past 8 years on respiratory impairment caused by farming procedures were surveyed. The role of pesticides in respiratory impairment was considered. Pesticides are among the causes which induced respiratory impairment and which aggravated the symptoms. Non-specific respiratory impairment includes chronic bronchitis, bronchial asthma, and pulmonary emphysema. Specific respiratory diseases caused by pesticides included pesticide pneumonia and pesticide-induced asthma. It is noteworthy that respiratory impairment was frequently appravated by pesticide application.

**77-2683.** Sugaya, T. ; Hayashi, S. (Hiraga General Hospital, Hiraga, Akita, Japan) **[Health status of farmers engaged in fruit and rice growing (especially fruit tree growing farms); results of medical investigations.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 208-211; 1977. (Japanese)

Medical examination of farmers revealed some damage due to pesticides. The ratio of serum cholinesterase activity after to that before application of parathion (before it was banned in Japan) ranged from 36.3 to 64.0. (2) Urinary concentrations of *p*-nitrophenol before, during, and after application of parathion were 4.0, 11.7, and 11.7 mg/10 ml (average of 21-25 persons). The percentage of positivity in patch tests on chlorothalonil, captafol, nitrofen, thiophanate, paraquat dichloride, and benomyl in orchard farmers was 91.7, 33.3, 22.2, 22.2, 2.8 and 13.9%, resepctively, and was generally higher than that in non-farming persons. In general, the percentage of persons having symptoms due to pesticide application was higher in persons working in orchard farms than in farmers engaging in rice culture.

**77-2684.** Sugaya, T. ; Wakatsuki, S. (Inst. Rural Med., Hiraga General Hospital, Hiraga, Akita, Japan) **[Clinical cases of pesticide intoxication throughout Japan, 1976.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 302-303; 1977. (Japanese)

Clinical reports of symptoms attributable to pesticides were investigated from 17 medical organizations in 1975. The number of reported cases was 70 in men and 34 in women, including 2 cases in teenagers and 5 cases in elderly persons older than 70. The intoxication occurred in 88 cases during application, in 18 cases at other times, in 2 cases by accidental ingestion, and in 16 cases with suicidal intent. There were three fatalities in men and three in women due to paraquat dichloride (3 cases), malathion, EPN and chlorfenvinphos. Intoxication was due to organophosphates (38 cases), organosulfurs (20 cases), *N*-methylcarbamates (16 cases), herbicides (10 cases), and other pesticides (34 cases including those of nocotine sulfate). The major pesticide caus-

ing intoxication was nicotine sulfate (27 cases). EPN (6 cases), dichlorvos (6 cases), fenitrothion, benthiocarb, dithane, monox, and paraquat dichloride (5 cases each), *S*-benzyl diisopropyl phosphorothioate, malathion, and lime-sulfur (3 cases each), and trichlorfon and methomyl (3 cases each). Acute intoxication, skin injuries, and respiratory damage accounted for 70, 53, and 1 cases, respectively; no ocular impairment was reported, but it probably occurred. Twelve of the cases were considered to be chronic.

**77-2685.** Noikura, Y. ; Chuma, Y.; Mori, E. (Second Dept. Internal Med., Fac. Med., Kagoshima Univ., Kagoshima, Japan) **[Result of medical investigations on health status of farmers engaging in vinyl green house cultivation (centered on pesticide intoxication).]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 304-305; 1977. (Japanese)

A medical survey was carried out on the health status of 41 farmers in 21 homes (20 men and 20 women) working in vinyl greenhouses in Makurazaki, Kagoshima Prefecture. The pesticide application frequency was 2.6-3.7 for man and 2.6-3.3 for women each month. The percentage of workers using masks during application was 36.0-77.8 for men and 44.5-60.0% for women. The percentage of workers using protective clothing during application was 50.0-56.7% for men and 25.3-50.0% for women. The percentage of workers washing their hands, legs, and faces after working was 100-88.3% for men and 94.7-80.0% for women. Subjective symptoms during application appeared strongly in 1-3 men and 2-7 women per group, while symptoms appeared after application in 2-5 men and 1-6 women. The principal subjective symptoms were eye-pain and rash skin. No anemia was found in men, and slight anemia was seen in 1-7 women. Reduced serum ChE activity was seen in 3 men and 3-6 women in 1973 and 1974. Generally, it was found that the incidence of intoxication during application diminished with advancing years.

**77-2686.** Nagata, H. ; Izumiyama, T.; Kawata, K.; Takano, S.; Saito, M.; Masui, T.; Suzuki, K.; Kobayashi, S.; Yamagishi, M. (Hokushin General Hospital, Federation for Welfare, Nagano, Japan) **[Results of many-sided investigation on the health status of pesticide applicators in a grape-apple growing area where many pesticides are applied together. Part 2.]** *Nihon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 306-307; 1977. (Japanese)

A questionnaire including a self-evaluating health calender and self-evaluating protective garment calendar was filled out by 42 men and 25 women. Results of medical examinations on pesticide applicators (39 men and 14 women) and results of EEF examinations on speed-sprayer operators from 1976 were compared to those of 1975. Although the average number of days when pesticides were applied per person was less in 1976 than in 1975, the percentage of persons who felt subjective symptoms during application showed an increase in 1976, especially for speed-sprayer operators. Although the frequency of occurrence of symptoms during application in persons with subjective symptoms during application was significantly higher in cases when more than 3 pesticides were applied in 1975, no difference was found in 1976. Although the occurrence of symptoms was significantly higher when organophosphorus pesticides were used in 1975, it was significantly higher when nicotine sulfate was used in 1976, probably due to the use of protective garments. An increase in nicotine intoxication was noticed in 1976. No steady relationship was found between persons with abnormal EEG and the numbers with occurrence of symptoms. These findings show that a change in chronic health impairment could be found via a self-evaluating health calendar.

**77-2687.** Ishige, T. ; Uchida, A. (Inst. Rural Med., Fac. Med., Chiba Univ., Chiba, Japan) **[Findings on EEG of speed-sprayer operators in pear orchards in Chiba Prefecture (Part 2.)]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 308-309; 1977. (Japanese)

Results of EEG and several items of medical and biochemical examinations on 15 operators of speed sprayers in pear orchards were compared. The names of the pesticides and their times of application in 1976 were fenitrothion (96), dithane (93), 8-oxyquinoline plus propineb (51), bisdithane (46), benomyl (29), cyanox (28), copper 8-quinolinolate (26), estox (25), dichlorvos (25), anilazine (17) and others (48). No change in the examined values between before and after application was found. No change in EEG findings was seen before and after application, although there were some observations of abnormal EEG in comparisions between operators. Almost no difference in other examined values was found.

**77-2688.** Yagi, F. ; Kanafuki, Y.; Manabe, K.; Ise, H.; Imakawa, O. (No affiliation given) **[A case report of acute intoxication due to paraquat-dichloride.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 330-331; 1977. (Japanese)

A 21-year-old male farmer was found to have swallowed 90 ml of a herbicidal preparation of paraquat dichlroide with suicidal intent. After stomach washing he was hospitalized. Findings were: unstable consciousness, facial reddening, body temperature of 27.2°C, pulse normal, blood pressure 150:94, hyperemia in ocular conjunctivae, absence of light reflex, reddening of oral cavity with positive albuminuria, severe glycosuria, occult blood, increased GOT and GPT. Subcutaneous and mediastinal emphysema were found by roentgenography. He was treated with replacement transfusion, antibiotics, adrenal cortex hormone and cardiotonic-diuretics, but his mental agitation, unstable condition, and vomiting were not improved. From the third hospital day, jaundice appeared with elevated GPT. He could not open his eyes or mouth. On the fourth hospital day he died, anuric and with dyspnea, cyanosis, and high BUN. The direct cause of his death was diagnosed as acute renal failure due to ingestion of paraquat dichloride.

**77-2689.** Horiuchi, N. ; Kambe, Y.; Kato, E.; Ando, S.; Yanagisawa, T. (Saku General Hospital, Saku, Nagano, Ja-

pan) **[Studies on diagnostic standards on dermatitis due to pesticides, part 4. Investigation on lettuce growing farmers.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 566-567; 1977. (Japanese)

Continuing from 1975, a patch test with 20 kinds of pesticides was carried out on 21 male and 33 female farmers engaging in lettuce culture in Kawakami Village in Saku County, Nagano Prefecture. In this group, 16 males and 28 females had a past histiry of pesticide dermatitis. The pesticides and percentage of persons who showed positive results on the back were as follows: german Bordeaux (1.9%), Quinon copper (copper 8-quinolinolate) (0), mancozeb (1.0), maneb (10.5), orthocide (captan) (7.6), difolaton (13.3), daconil (chlorothalonil) (24.8), nicotine sulfate (10.5), salithion (6.7), dichlorvos (12.4), etc. The number of persons who showed any positive response was 8 men and 16 women, far smaller than in 1975. Forty-five percent of the persons who showed positivity in 1975 also showed positivity in 1976. In a photoallergic pesticide test in which UV light was shined on the area where the pesticide patch had been applied, paraquat dichloride (24%), daconil (24%) dichlrovos (12.1), and trepanocide (12.1%) showed stronger positivity. Another experiment in which pesticides werre applied as a patch with different concentrations showed that there was concentration-response relationship in daconil and dichlorvos.

**77-2690.** Okabe, S. ; Hanada, K.; Suzuki, Y.; Watabe, K.; Kotanagi, A. (Inst. Rural Med., Hiraga General Hospital, Hiraga, Akita, Japan) **[Studies on the patch test for dermatitis due to pesticides. Part 5. Studies on test chemicals and methods of application.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 570-571; 1977. (Japanese)

A patch test was carried out on 14 men and 17 women from a fruit tree growing area in Yokote city. Captafol and dichlorvos were used as test pesticides at 1000 fold dilutions in distilled water, olive oil, or white vaseline. The patches were applied with or without pressure according to Fernstrom. The effect (positivity) was weakest in olive oil, and no difference was found in positivity between distilled water and white vaseline. After 24 hrs of application, the positivity was stronger with pressure for dichlorvos, but no difference was found with captafol. Increasing the contact time to 24 hr made no difference in pressure patching. Generally, the positivity was higher in patching for 24 hr than for 48 hrs.

**77-2691.** Nakayama, J. ; Fijii, I.; Matsuoka, H.; Isobe, A. (Author address not given) **[Relationship between skin eczema and serum cholinesterase activity on watermelon growing farms.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 574-575; 1977. (Japanese)

Medical examinations were performed on 22 men and 28 women in a watermelon growing village in Misumi, Yamaguchi Prefecture, in January and July 1976. Many cases of skin eczema and many persons with reduced serum cholinesterase activity were found. Marked skin eczema was present in seven men and five women, and 9 men and 8 women showed serum cholinesterase activity of less than 0.74. The pesticides (dithane, chlorothalonil, captafol, propineb and kelthane) were applied on the average on 10 days by men and 8 by women in watermelon fields. Although a relationship between captafol application and eczema was recognized, there was insufficient evidence to prove a relationship between captafol application and reduced activity of serum cholinesterase.

**77-2692.** Mofenson, H. C. ; Greensher, J. (Poison Control Center, Naussau County Med. Cen., Naussau, NY) **Controversies in the prevention and treatment of poisonings.** *Pediatr. Ann.* 6(11): 60-74; 1977. (30 references)

Recent changes and controversies in the prevention and treatment of poisonings are presented. Syrup of Ipecac emetic is safe, effective, available without prescription, and should be in every home of families with small children. A great deal of inaccurate first-aid instruction on poisonings exists on product labels and in first-aid books and needs to be corrected. The signal word labeling requirement for pesticides serves as a good model for labels. The banning of DDT for environmental reasons, and the substitution of other pesticides which are more toxic to children is also considered.

**77-2693.** Prochnicka, B. ; Kwiecien-Glowacka, E.; Bialka, J. (Dep. Med., Zaklad Medycny Sadowej Acad. Med., Am, 31-531 Krakow, Poland) **Przypadek smiertelnego zatrucia gramoxonem. [A case of fatal intoxication with paraquat.]** *Przegl. Lek.* 34(5): 511-512; 1977. (10 references) (Polish)

A case of fatal suicidal poisoning of a 51-yr-old woman by ingestion of 100 ml of concentrated paraquat is reported. Pain in the buccal cavity, esophagus and epigastrium, and emises were the first poisoning symptoms. She died of circulatory and respiratory insufficiency on the 9th day in spite of early treatment and dialysis. The paraquat content found in the kidneys was 0.235 mg%.

**77-2694.** Leary, P. M. (Red Cross War Memorial Children's Hospital and Inst. of Child Health, Univ. Capetown, South Africa) **A poisons reference centre for children.** *S. Afr. Med. J.* 50(12): 477-479; 1976. (1 reference)

A statistical analysis of poisoning cases treated at the Red Cross Children's Hospital in Cape Town, South Africa is presented. The organization and function of the Poisons Reference Center, which was established in the outpatient department of the hospital, are described. During the year 1974, 456 patients were treated for poisoning in the outpatient department. Of these 52 cases were caused by various garden pesticides, and 10 cases were caused by parathion.

**77-2695.** Anikina, N. E. (Cent. Board Plant Protect., Glavnoe upravlenie zashchity rastenii MSKH USSR) **Osnovnye trebovaniia tekhniki bezopasnosti pri rabote s pestitsidami [Major safety requirements for dealing with pesticides.]** *Sakh. Svekla* 3:34-36; 1977. (Russian)

Major safety requirements for dealing with pesticides are given as follows: (1) A thorough preparation of the per-

sonnel and work under experienced specialists; (2) Toxic chemicals not necessary for a particular cultivation must not be used; (3) Cultivation should be done at the assigned times; (4) Only machines and instruments in good working condition can be used in fertilizing; (5) Rules for the preparation of pesticides solutions must be observed; (6) The toxins must be kept in specially designated places, and the personnel must be appropriately atired; (7) Pesticides must be transported in special containers; (8) There must be a thorough paper work accompanying different phases of pesticide use; (9) People living near the area to be cultivated must be informed well in advance of the place and time of fertilization, the kind of ferilizer to be used, etc., and (10) Warning signs must be placed 900 ft from the cultivated area.

**77-2696.** Yamada, Y. (Dept. Internal Med., Johoku Hospital, Kyomachi, Kanazawa Prefecture, Japan) **[A case of acute carbon disulfide poisoning by accidental ingestion.]** *Sangyo Igaku (Jpn. J. Ind. Health)* 19(3): 140-141; 1977. (4 references) (Japanese)

A 42-year-old woman who had used carbon disulfide for a few years to control insects in warehouses accidentally ingested about 5 ml of carbon disulfide from a used soft drink bottle on June 26, 1976. After 5 hr of induced vomiting she felt numbness in the lips and, nausea, and she vomited. After 12 hr abdominal pain, pyrexia, and wave form agitation appeared, and she was hospitalized. Her status abnormalities on admission (positive included): conspicuous agitation, accentuated tendon reflex of extremities, Babinski reaction in lower extremities positive, and hyperesthesia. After 16 hr, all subjective symptoms of illusion and delusion, however, showed a healthy orientation. Repeated illusion and delusions appeared after discharge. At 12 days after ingestion she had recovered except for amnesia. She is quite healthy now in Sept, 1975. After 16 hrs of ingestion, transient sinus tachykardia and sharp P wave (induced by II, III and aVf) appeared in ECG. Abnormal EEG, such as sudden group of theta waves of higher potential, light-induced theta waves, etc. was observed from June 28 to July 2. It is said that carbon disulfide is widely used in food storage for insect control.

**77-2697.** Bascom, W. (Author address not given) **The disposal of waste in the ocean.** *Sci Am.* 231(2): 16-25; 1974.

The problem of disposing of waste products in the oceans is considered in relation to the quality of ocean water and marine life along the U.S. Atlantic, Gulf and Pacific coasts. Water is considered to be polluted if it is not of sufficiently high quality to be suitable for the highest uses people wish to make of it at present or in the future. These highest uses for ocean water are seen to be water-contact sports, the production of seafood, and the preservation of marine life. To maintain the ocean waters at an acceptable level of quality it is necessary to consider the main inputs of possible pollutants resulting from human activity. Various pollutants considered in the article include fecal waste, wastes from industrial activities, dumping from barges, chemical wastes, and thermal wastes which include the warmed water from coastal power plants and cooled water from terminals where ships carrying liquid natural gas are berthed. Also considered are ships which heave trash and garbage overboard and pump waste from their ballast tanks and bilges. Aerial fallouts are also considered - problems with pesticide drift, soot from chimneys, and residue from exhaust of cars and planes.

**77-2698.** Sidorov, K. K. ; Shapiro, A. B. (Inst. Indust. Hyg. Occup. Med., Acad. Med. Sci. Moscow, USSR) **Obosnovanie orientirovochnikh bezopasnikh urovnei vozdeistviia vrednykh veshchestv v vozdukhe rabochei zony [Basis for a fairly safe level of air pollution in work areas.]** *Vrach. Delo* (3): 131-133; 1977. (7 references) (Russian)

A study was conducted on 118 organic industrial pollutants to determine the relationship between various parameters of toxicometry, especially between the median letnal dose ($LD^{50}$) and the reaction threshold (Lim-ch) in order to find the basis for an approximate safe level of air pollution (ASLAP). The correlation coefficient was 0.71 0.05, $P > 0.001$, the $CL_{50}$ was from 7 to 144000 mg/m$^3$ and Limch = 0.005-4100 mg/m$^3$. Only when there was a close relationship could the simple linear regression equation be calculated. The standard deviation (*Sxy*) for Limch was 0.69, i.e. the calculated values for 2/3 of the juxtaposed substances were not more than 5 times higher than those obtained experimentally. The ratio $LD^{50}$/Lim-ch was used to determine the cumulative effect of the pollutants. The results of the study show a satisfactory correlation between the calculated values for ASLAP and the threshold levels which were calculated experimentally and were legal.

**77-2699.** Anonymons (No author address given) **Odyssey of Agent Orange ends in the Pacific.** *Science* 197(4307): 966-967; 1977.

The development and consummation of plans to dispose Agent Orange (AO), (50% 2,4-D and 50% 2,4,5-T), the defoliant used in military operations in Vietnam is described; AO contains traces of the highly toxic contaminant dioxin. The U.S. EPA approved a plan to dispose of over 2,000,000 gallons of AO by incineration at temperatures not lower than 2150 C. Incineration of AO has occurred at numerous sites including aboard the ship Vulcanus in the Pacific Ocean 120 miles west of Gulfport Island. The steel canisters that stored AO will be melted down in steel furnaces.

**77-2700.** Moccia, R. D. ; Leatherland, J. F.; Sonstegard, R. A. (Dep. Zool., Univ. Guelph, Guelph, Ontario, Canada) **Increasing frequency of thyroid goiters in coho salmon ( *Oncorhynchus kisutch*) in the Great Lakes.** *Science* 198: 425-426; 1977. (14 references)

Coho salmon collected during the 1976 spawning runs from Lakes Michigan, Ontario, and Erie had overt goiter frequencies of 6.3, 47.6, and 79.5 percent, respectively. These represent significant increases over the frequencies observed in previous years. Epizootiological data suggest that environmental goitrogens (possibly pollutants) may be in-

volved in the etiology of the thyroid disorder. (Author abstract by permission)

**77-2701.** Beck, B. E. ; Wood, C. D.; Whenham, G. R. (Vet. Serv. Lab., Alberta Res. Council, Vet. Field Serv., Edmonton, Alberta, Canada) **Triaryl phosphate poisoning in cattle.** *Vet. Pathol.* 14(2): 128-137; 1977. (47 references)

Necropsies were performed on four clinically paralyzed cows which had been accidentally poisoned with triaryl phosphates including TOCP, and on four calves and two cows which were experimentally intoxicated when orally administered a commercial triaryl phosphate mixture, Fyrquel 150. The accidentally poisoned cows and experimentally poisoned calves (given 5-20 gm/kg triaryl phosphate) showed emphysema, axonal degeneration in the spinal cord, and depressed cholinesterase activity. Clinical signs in the calves before death included diarrhea, abdominal pain, rapid respiration, salivation, miosis, dehydration, depression, and coma. There was no paralysis or specific motor dysfunction, as had been observed in the accidentally poisoned cows. Treatment with atropine sulfate produced no noticeable response. The clinical signs in the experimentally poisoned cows, which had been given 0.5-1 gm/kg triaryl phosphate, were the same as in the calves, but the signs began to abate within 2 days. These animals appeared normal between 7 and 19 days after dosing, after which progressive paralysis developed. Necropsy revealed the same type of lesions seen in the calves and accidentally poisoned cows. At high doses, triaryl phosphates cause death by cholinesterase inhibition, whereas at lower doses, the cholinesterase inhibition is transient and death results from damage to the nervous system.

*see also* **77-2601** **77-2630** **77-2766** **77-2781** **77-2798** **77-2803** **77-2824**

**77-2702.** Blomquist, L. ; Thorsell, W. (Dept. Pharmacol., Royal Veterinary Coll., S-751 23 Uppsala, Sweden) **Distribution and fate of the insect repellent$^{14}$C-*N,N*-diethyl- *m*-toluamide in the animal body. II. Distribution and excretion after cutaneous application.** *Acta Pharmacol. Toxicol.* 41(3): 235-243; 1977. (20 references)

*N,N*Diethyl-*m*- toluamide-carbonyl-$^{14}$C ($^{14}$C-DEET) in 0.3% solution of 20% ethanol was smeared on the shaved backs of laboratory mice and whole-body autoradiography, impulse counting of skin radioactivity, and measurement of$^{14}$C urinary excretion were performed. A 25% solution of$^{14}$C-DEET which is within the highest concentration range of most commercial products in absolute ethanol was also applied to a human volunteer, and$^{14}$C urinary excretion was measured. In the mice, high concentrations of radioactivity were found in the lacrimal gland, liver, bile, intestinal contents, kidney, urine, and nasal mucosa. This picture was similar to results previously obtained after intravenous injection of the insect repellent. Urinary excretion of ($^{14}$C-DEET) occurred early after application in mice, while excretion reached its peak after several hours in the human subject. Low but significant excretion of$^{14}$C-DEET persisted throughout the entire observation period of one month in the mice, probably resulting from persistence of the chemical in the skin of mice as determined by quantitative measurements. This study indicates that adverse systemic effects may result from cutaneous absorption of DEET.

**77-2703.** Elo, H. ; Ylitalo, P. (Dep. Biomed. Sci., Univ. Tampere, Box 607, SF-33101 Tampere 10, Finland) **Substantial increase in the levels of chlorophenoxyacetic acids in the CNS of rats as a result of severe intoxication.** *Acta Pharmacol. Toxicol.* 41(3): 280-284; 1977. (10 references)

Different degrees of$^{14}$C-labeled 2-methyl -4- chlorophenoxyacetic acid (MCPA) poisoning were produced by subcutaneous injection of the sodium salt of MCPA (0-5 mg/kg) in adult male Sprague-Dawley rats to assess the effects on the central nervous system (CNS). Beginning 0.5 hr after MCPA application, cerebrospinal fluid was collected for 1 hr, then plasma and tissue samples were immediately taken. All samples were analyzed in a liquid scintillation counter using external standardization. From 3.5 to 4.5 hr after MCPA administration radioactivity in the brain, CSF, and liver increased linearly with dose. Radioactivity in the skeletal muscle and other reference tissues increased only slightly with dose, while radioactivity actually decreased in the plasma and kidneys during intoxication. The level of MCPA in the CSF was related to the level of intoxication. These findings indicate that during acute MCPA poisoning the levels of these compounds in the brain are greatly increased and that the CNS is an important target organ in the toxicity of the chlorophenoxyacetic acids. The mechanism of MCPA accumulation in the brain and CSF remains to be elucidated.

**77-2704.** Lakowicz, J. R. ; Hogan, D. (Freshwater Biol. Inst., Univ. Minnesota, P.O. Box 100, Navarre, MN 55392) **Diffusional transport of toxic materials in membranes by fluorescence spectroscopy.** *Adv. Exp. Med. Biol.* 84: 509-546; 1977. (30 references)

Collisional quenching fluorimetry was used to investigate the diffusional rates of quenchers in membranes and the partitioning of these quenchers between water and lipid phases. Emission spectra were determined on a SLM spectrofluorometer and fluorescence lifetimes were determined using a phase-modulation spectrofluorometer from the same company. Synthetic phospholipid vesicles were prepared from $\beta$ -$\gamma$-dimyristol -L- $\alpha$-lecithin, $\beta$-$\gamma$-dipalmitoyl-L-$\alpha$-lecithin, and cholesterol using a sonication method. Among the quenchers studied were the pesticides DDT, Dicryl, Dibrom, Endrin Lindane, and Mirex. Because fluorescent probes may be located in any desired region of the lipid bilayer, it is possible to investigate the permeability barriers which cell membranes present to molecules for which specific transport mechanisms do not exist. The techniques describe within this paper were not designed to be limited to lipid bilayers, but should prove applicable to whole cells and layers of cells.

**77-2705.** Vargova, M. ; Rosival, L. (Natl. Inst. Hyg., Bratislava, Czechoslovakia) **Hygienicko-toxikologicke hodnotenie pesticidov. [Hygienic-toxicological evaluation of pesticides.]** *Agrochemia (Bratislava)* 17(5): 137-140; 1977. (5 references) (Slovak)

The toxicological evaluation of pesticides, designed to assess the risk of their handling by humans, is reviewed on the basis of results obtained in long-term studies on animals expressed as LD50 values after peroral and percutaneous application. The basic toxicological studies involve identification of the material to be tested; determination of acute toxicity, cutaneous toxicity, irritation of skin and eyes, allergic effect, inhalation toxicity, and subcutaneous toxicity; and further more determination of the degradation products and metabolites, metabolic studies on animals, chronic toxicity studies, carcinogenicity, neurotoxicity, effects on reproduction, teratogenic effects, mutagenic effects, and combined effects.

**77-2706.** Drudge, J. H. ; Lyons, E. T.; Taylor, E. L. (Dep. Veterinary Sci., Coll. Agric. Univ. Kentucky, Lexington, KY 40506) **Critical tests and safety studies on trichlorfon as an antiparasitic agent in the horse.** *Am. J. Vet. Res.* 37(2): 139-144; 1976. (8 references)

In three series of tests trichlorfon at single dosages of 20, 30, 40, 60, 80, and 100 mg/kg was administered intragastrically by tube with the daily grain ration, intramuscularly, or topically to a combined total of 46 horses to test its effectiveness against bots, ascarids, pinworms, and large strongyles. The results of these clinical trials are presented. Dose rates of 40 mg/kg and less were generally well tolerated by critical test horses. Doses of 60 and 80 mg/kg administered by stomach tube induced moderately severe to severe colic and diarrhea; 80 mg/kg given with the feed only resulted in a transient softening of the feces. These studies demonstrate the anthelminthic activity of trichlorfon at the safe dose level of 40 mg/kg.

**77-2707.** Coytubo, J. A. ; Simmon, V. F.; Spanggord, R. J. (Microbial Genetics Program, Stanford Res. Inst., Menlo Park, CA 94025) **Investigation of mutagenic effects of products of ozonation reactions in water.** *Ann. NY Acad. Sci.* 298: 124-140; 1977. (5 references)

A study of the potential biological activity of ozonation products in aqueous systems was conducted to evaluate the use of ozone treatment for drinking and waste waters. Rapid *in vitro* microbiologic bioassays were performed on 28 organic compounds subjected to ozonation. Conditions for treatment were more severe than those which would apply to ozonation in water treatment facilities. Samples of municipal effluent which had already been disinfected by various processes were also examined. Only seven of the 28 compounds tested showed any mutagenic activity, and in those cases the activity was not dose-related and usually resulted from prolonged ozone exposure. Further studies on ozone, as well as on chlorine dioxide, are being conducted.

**77-2708.** Munnecke, D. M. ; Hsieh, D. P. H. (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616) **Pathways of microbial metabolism of parathion.** *Appl. Environ. Microbiol.* 31(1): 36-69; 1977. (14 references)

Research on the development of a mixed culture, microbial system for the complete detoxification of concentrated aqueous solutions of parathion is reported; preliminary findings on parathion hydrolase, the key enzyme of parathion hydrolysis, are also discussed. The mixed culture used in these experiments consisted of at least 9 bacterial isolates: five fluorescent pseudomonads, *Brevibacterium, Azotomanas, Xanthomonas,* and one unknown species. The primary oxidative pathway of parathion metabolism comprises an initial hydrolysis to yield diethylthiophosphoric and *p*-nitrophenol. A secondary pathway involved oxidation of parathion to paraoxon and subsequent hydrolysis to *p*-nitrophenol and diethylphosphoric acid. Under low oxygen conditions, parathion was reduced to *p*-aminoparathion and subsequently hydrolyzed to *p*-aminophenol and diethylphosphoric acid. A crude cell-free isolate of PAR hydrolase hydrolyzed paraoxon at a maximum rate of 6.0 mol/mg/min with a *Km* of approximately 88 mg/L; hydrolysis of paraoxon was about 11% faster than hydrolysis of parathion. The enzyme was inducible and stable at room temperature, and it retained 100% of its activity when heated to 55°C for 10 min. Enzymatic hydrolysis of parathion to water soluble *p*-nitrophenol (PNP) coupled with whole cell metabolism of PNP could constitute an efficient and complete industrial system for the detoxification of parathion.

**77-2709.** Heritage, A. D. ; Mac Rae, I. C. (Dep. Microbiol., Univ. Queensland, St. Lucia, Brisbane, Australia, 4067) **Degradation of lindane by cell-free preparations of *Clostridium sphenoids*.** *Appl. Environ. Microbiol.* 34(2): 222-224; 1977. (4 references)

Attempts to obtain cell-free preparations of *C. sphenoides* that could degrade the insecticide lindane, (HCH) are described. The cell free extracts were prepared by sonication and centrifugation, and the reaction mixture was assayed by gas chromatography. HCH was degraded to γ-3,4,5,6-tetrachloro-1- cyclohexane (TCCH) in the presence of reduced glutathione. The enzymes of C. sphenoides responsible for conversion of HCH to TCCH appear to be largely associated with the membrane, because the membrane preparation showed more rapid conversion than the cell-free preparation, and conversion also occurred to other products as yet unknown. The time course of conversion suggest that the enzymes involved are fairly stabel, a property which should prove useful in the characterization of the active proteins. This study is the first to demonstrate degradation of HCH by cell-free bacterial preparations and to localize the activity of the enzyme responsible to the membrane fraction.

**77-2710.** Duaghton, C. D. ; Hsieh, D. P. H. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Parathion utilization by bacterial symbionts in a chemostat.** *Appl. Environ. Microbiol.* 34(2): 175-184; 1977. (73 references)

A continuous culture device utilizing sewage and agricultural runoff was tested with microorganisms capable of using the organophosphorus insecticide parathion as the sole growth substrate. Descriptions of the parathion-acclimated bacteria and data obtained from their growth on a two stage chemostat are reported. *Pseudomonas stutzeri* non-oxidatively and cometabolically hydrolyzed parathion to ionic diethyl thiophosphate and *p*-nitrophenol; *P. aeruginosa* , also in the culture, metabolized the *p*-nitrophenol as a sole carbon and energy source. The ionic diethyl phosphate was found to be inert to transformation. Methyl parathion was metabolized in an analogous way. Parathion functioned as the growth limiting factor in the chemostat, and dissimilation rates of 8 g/l/day for parathion and 7 g/l/day for *p*-nitrophenol were attained. The use of microorganisms in continuous culture could provide a valuable means of determining the possible environmental fates of synthetic xenobiotics. Compounds ordinarily toxic in batch culture could serve as substrates in low steady state concentrations achievable in the chemostat.

**77-2711.** Fuchs, V. ; Golbs, S.; Kuhnert, M.; Osswald, F. (Sekt. Tierprodukt. Veterinaermed., Karl-Marx-Universitaet, 701 Leipzig, DDR.) **Studies into prenatal toxic action of parathion methyl on Wistar rats and comparison with prenatal toxicity of cyclophosphamide and trypan blue.** *Arch Exp. Vet. Med.* 30(3): 343-350; 1976. (17 references) (German)

Methyl parathion was tested for possibly embryotoxic and teratogenic effects. Wistar rats were treated with 0.1-3 mg/kg doses of methyl parathion p.o. every other day from the fifth till the 15th-19th days of pregnancy. The fetal resorption rate was 19-20% in animals treated with 3 mg/kg doses, vs. 9.8% in the controls. There was no significant difference in the resportion rate between the controls and the animals treated with lower doses. Developmental retardation of the fetuses (reduced length and body weight) was also seen in the group treated with 3 mg/kg doses. Methyl parathion

had no teratogenic effect (no malformations were seen). The findings indicate the embryotoxic effect of methyl parathion.

**77-2712.** Dedek, W. ; Wenzel, K.; Schwarz, H. ((Forschungsst. Chem. Toxikol., Adad. Wiss. DDR, 701 Leipzig, DDR) **Studien *in vitro* und *in vivo* zur perkutanen Resorption systemischer $^{32}$P-markierter insektizider Organophosphorverbindungen am Rind. [*In vitro* and *in vivo* studies on cutaneous absorption of systemic insecticidal organophosphorus compounds labeled with $^{32}$P in cattle.]** *Arch. Exp. Veterinaermed.* 29(6): 857-868; 1975. (24 references) (German)

The influence of various factors on the percutaneous resorption of $^{32}$P-labeled organophosphorus pesticides (trichlorfon, butonate, and dimethoate) was studied *in vitro* on isolated bovine skin strips. The percutaneous resorption of strongly polar pesticides usually increased with decreasing polarity of the alcohol used as solvent, weakly polar pesticides were resorbed at higher rates from highly polar solvents. Percutaneous resorption was greatly influenced by the solubility of the pesticide as well. The resorption was usually highest when the highest possible pesticide concentration was used. Surfactants such as sodium dodecylsulfate, dodecylpyridinium bromide, and Parwozell W-ON caused about 100% increase in the resorption from oily and aqueous solutions. The relatively nonpolar butonate was the only pesticide whose penetration was increased by dimethylsulfoxide. Aqueous-alcoholic solutions have considerably poorer wetting capacity on bovine skin than have oily solutions.

**77-2713.** Bruener, H. ; Gandawidjaja, L.; Hettwer, H.; Oldiges, H. (Einrichtungen, Univ. Duesseldorf, 4000 Duesseldorf, Germany) **Moeglichkeiten einer kombinierten Antidotterapie an Ratten bei Vergiftungen mit Phosphorsaeureestern. [Possible combination antidotal therapy in rats following intoxication with phosphoric acid esters.]** *Arzneim. Forsch.* 27 part 2 (10): 1983-1988; 1977. (38 references) (German)

The effectiveness of combinations of atropine and toxogonin with Actihaemyl (protein-free calf serum extract of low molecular weight) in the antidotal treatment of female Sprague-Dawley rats poisoned with multiples of the respective $LD_{50}$ doses of paraoxone, soman and O,O-diisopropylfluorophosphate (DFP) was studied. All antidotes were given i.m.; the atropine dose was 7.5 mg/kg, the toxogonin dose 12.5 mg/kg, and Actihaemyl was given in a dose of 2.5 mg/kg. Actihaemyl, given together with atropine, toxogonin or their combinations, reduced the 24-hr mortality (delayed the death of the animals), increased the survival rate in groups treated with relatively low organophosphate doses, and caused earlier regeneration. The combination of Actihaemyl with atropine plus toxogonin was most effective. Actihaemyl potentiates the effect of these antidotes, but it has no antidotal effect.

**77-2714.** Norman, B. J. ; Poore, R. E.; Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ., Nashville, TN 37232) **Studies of the binding of sulfur released in the mixed-function oxidase-catalyzed metabolism of diethyl *p*-nitrophenol phosphorothionate (parathion) to diethyl *p*-nitrophenyl phosphate (paraoxon).** *Biochem. Pharmacol.* 23: 1733-1744; 1977. (13 references)

Incubation of [$^{35}$S]labeled parathion with rat liver microsomes in the presence of an NADPH-generating system leads to the covalent binding of sulfur to the macromolecules of the microsomal membrane. The maximal binding of sulfur to microsomes requires the presence of NADPH, is increased using microsomes from phenobarbital and 3-methylcholanthrene-treated animals, and is inhibited by carbon monoxide. The majority, if not all, of the sulfur bound is in a form free of the remainder of the parathion molecule. These findings, coupled with the fact that the apparent Km and Vmax for sulfur binding are not statistically different from the apparent *Km* and *Vmax* for metabolism of parathion to paraoxon, indicate the sulfur bound is that released in the mixed-function oxidase-catalyzed metabolism of parathion to paraoxon. Under the conditions of the experiments described in this report, the binding of sulfur to microsomes decreases the concentration of cytochrome P-450 in the microsomes and inhibits slightly the rate of the mixed-function oxidase-catalyzed metabolism of benzphetamine.

**77-2715.** Cohen, S. ; Orzech, D. (Sec. Pharm. and Toxicol., Sch. Pharm., Univ. Connecticut, Storrs, CT 06268) **Triorthotolyl phosphate inhibition of carboxylesterases and potentiation of procaine toxicity.** *Biochem. Pharmacol.* 26(19): 1791-1795; 1977. (17 references)

Groups of mice were given single doses of triorthotolyl phosphate (TOTP) (1-25 mg/kg, i.p.) 18 hr prior to sacrifice or procaine challenge. A dose-dependent decrease was recorded in liver carboxylesterase hydrolysis of diethyl succinate, triacetin and procaine. TOTP pretreatment shortened the time to onset and prolonged the duration of procaine (175 mg/kg, i.p.)-induced loss of righting ability. The correlation coefficient for inhibition of liver procaine hydrolysis and prolongation of procaine action was 0.97 ($P > 0.0001$). No deaths were observed in procaine-injected controls yet mortality after procaine injection in TOTP-pretreated mice increased as a function of the TOTP pretreatment dose. In addition, plasma procaine concentrations after procaine injection (150 mg/kg, i.p.) reached peak levels sooner, remained elevated longer and were 3-fold higher in the TOTP-pretreated mice as comparted to corn oil-pretreated procaine-injected controls. Results demonstrate potentiation of procaine toxicity by TOTP and suggest that this results from inhibition of procaine metabolism *in vivo*. (Author abstract by permission)

**77-2716.** Nachtomi, E. ; Sarma, D. S. R. (Fels Res. Inst., Dept. Pathol., Temple Univ. Sch. Med., Phila., PA 19140) **Repair of rat liver DNA in vivo damaged by ethylene dibromide.** *Biochem. Pharmacol.* 26(20): 1941-1945; 1977. (39 references)

Tube feeding of [$^{14}$C]ethylene dibromide (EDB) to non-fasted rats resulted in the incorporation of the radioac-

tivity into liver DNA, RNA and protein. Using alkaline and neutral sucrose gradients, it was observed that administration of the pesticide to non-fasted rat caused slower sedimentation of liver DNA in alkaline and not in neutral sucrose gradients. Slower sedimentation of liver DNA in alkaline sucrose gradients was apparent within 2 hr after the administration of a dose of 22 mg/100 g or 4 hr after a dose of 7.5 mg/100 g of body weight. Using a dose of 7.5 mg/100 g, the EDB-induced liver DNA damage was repaired significantly by 17.5 hr and almost completely by 96 hr. Administration of diethyldithiocarbamate, a free radical scavenger, did not inhibit liver DNA damage caused by EDB. (Author abstract by permission)

**77-2717.** El-Hawari, A. M. ; Plaa, G. L. (Dep. Pharmacol., Fac. Med., Univ. Montreal, Montreal, Quebec, Canada) **α-Naphthylisothiocyanate (ANIT) hepatotoxicity and irreversible binding to rat liver microsomes.** *Biochem. Pharmacol.* 26(20): 1857-1866; 1977. (32 references)

The hyperbilirubinemic effect produced by α-naphthylisothiocyanate (ANIT) in rats was significantly altered by different inducers and inhibitors of drug metabolism and protein synthesis, which supports the hypothesis that biotransformation of ANIT to a toxic metabolite is crucial to its cholestatic effect. The binding of a chemically reactive ANIT-derived product to rat liver microsomes was examined in vitro. When [$^3$H]ANIT or [$^{14}$C]ANIT was incubated with rat liver microsomes, radioactivity was bound irreversibly to proteins. This binding occurred in the absence (non-enzymic) and, to greater monoxide, β-diethylaminoethyl diphenylpropylacetate (SKF 525-A) and piperonyl butoxide, indicating that a cytochrome P-450-dependent, mixed-function oxidase mediated the binding. The enzymic binding was reduced by incubation with glutathione and other thiol-containing compounds, while incubation with β-naphthylisothicyanate or phenylisothiocyanate inhibited both the enzymic and non-enzymic binding. Pretreatment of rats with phenobarbital or 3-methylcholanthrene enhanced ANIT toxicity *in vivo* and markedly increased the irreversible binding in vitro. Piperonyl butoxide, SKF 525-A, disulfiram and cobaltous chloride reduced ANIT toxicity and its binding to microsomes in vitro. However, cycloheximide which abolished ANIT toxicity *in vivo* failed to affect the binding. Furthermore, 16-α-pregnenolone carbonitrile reduced ANIT toxicity in vivo but increased its enzymic binding. The results demonstrate an inconsistent correlation between toxicity of ANIT in vivo and its binding to microsomal proteins *in vitro* and indicate that binding *in vitro* in itself is not a valid index of ANIT-induced hyperbilirubinemia. Limited studied in vito in which the irreversible binding after different pretreatment also did not parallel ANIT toxicity. These data cast doubt on the role of such binding in the pathogenesis of ANIT-induced cholestasis. (Author abstract by permission)

**77-2718.** Cisson, C. M. ; Wilson, B. W. (Dep. Avian Sci., Univ. California, Davis, CA 95616) **Recovery of acetylcholinesterase in cultured chick embryo muscle treated with paraoxon.** *Biochem. Pharmacol.* 26(21): 1955-1960; 1977. (31 references)

Brief treatments with paraoxon (*O,O*-diethyl-*p*-nitrophenyl phosphate) irreversibly inhibited the acetylcholinesterase (AChE, acetylcholine hydrolase, EC 3.1.1.7) activity of cultured chick embryo muscle. Enzyme activity recovered as long as protein synthesis occurred, and was most rapid during the first 4 hr after paraoxon treatment. The initial recovery rate was related to the extent of initial inhibition of AChE activity: the more activity inhibited the more rapid the recovery. Differences noted between paraoxon-treated and untreated cultures during recovery included a 192 per cent increase in net AChE activity and an increase of 200 per cent in cell protein levels. AChE activity first appeared around the nuclei after paraoxon treatment, spread through the rest of the cell, and was released into the medium. The results suggest the presence of feedback control of the rapid recovery of AChE activity after organophosphate poisoning. (Author abstract by permission)

**77-2719.** Civen, M. ; Brown, C. B.; Morin, R. J. (Med. Res. Prog., Veterans Admin. Hos., Long Beach, CA 90822) **Effects of organophosphate insecticides on adrenal cholesteryl ester and steroid metabolism.** *Biochem. Pharmacol.* 26(20): 1901-1907; 1977. (23 references)

The organophosphate insecticides dichlorvos and chlorpyrifox oxon, inhibit adrenal cholesterol esterification and hydrolyses in vitro at dose concentrations that correlate closely with their inhibition of adrenal steroidogenesis. The results in vivo show that dichlrovos, given in the drinking water at 120 ppm, produced a statistically significant depression of plasma corticosterone during the rising phase of the normal diurnal rhythm. Both the control and treated adrenal free and esterified cholesteral levels show marked dirunal changes. In the control group there is a close parallelism between the diurnal changes in adrenal esterified cholesterol and plasma corticosterone levels. There is little difference between the diurnal curves of plasma corticosterone of the 20 ppm chlorpyrifos oxon-fed animals and their controls. When chlorpyrifos animals were stressed, the expected fall in adrenal cholesteryl ester levels was blocked, as was the activation of adrenal cholesteryl ester hydrolase. (Author abstract by permission)

**77-2720.** Aldridge, W. N. ; Casida, J. E.; Fish, R. H.; Kimmel, E. C.; Street, B. W. (Molecular Toxicol. Sec., Toxicol Unit, Med. Res. Council Lab., Carshalton, Surrey, England) **Action on mitochondria and toxicity of metabolites of tri-*n*-butyltin derivatives.** *Biochem. Pharmacol.* 26(21): 1997-2000; 1977. (22 references)

Tri-*n*-butyltin derivatives are metabolized by a cytochrome P450-dependent rat liver microsomal monooxygenase system and by mice to yield carbon-hydroxylated metabolites, i.e. the α-, β-, γ- and δ-hydroxybutyl-dibutyltin derivatives, as well as the corresponding γ-ketone. The later three metabolites are sufficiently stable at physiological pH for comparisons with tirbutyltin chloride with regard to their

action on mitochondrial functions and intraperitoneal toxicity to mice. The δ-hydroxy compound differs most greatly from the other metabolites in potency for altering mitochondrial functions possibly because of its greater polarity or its lower propensity for intramolecular coordination of the introduced oxygen with the tin atom. The γ-hydroxy, δ-hydroxy and γ-keto compounds are less toxic to mice than tributyltin derivatives and do not increase the water content of the brain under conditions where triethyltin bromide does. (Author abstract by permission)

**77-2721.** Udagawa, T. ; Miyata, T.; Saito, T. (No author address given) **Metabolism of continuous three weeks administered $^{14}$C-pyridafenthion, *O,O*-diethyl-*O*- (3-oxo-2-phenyl-2H-pyridazine-6-yl) phosphorothioate, in mouse.** *Bochu-Kagaku* 39(1): 15-18; 1977. (Japanese)

To assess the metabolism of pyridafenthion in the mouse, $^{14}$C-pyridafenthion ($^{14}$CP) was administered orally to a group of mice, at 20 mg/kg/day for 3 wk and to another group of mice in a single dose of 20 mg/kg. The rate of ($^{14}$CP) excretion in the feces and the urine, and the accumulation in the organs was measured and then compared in both these groups 24, 72, and 120 hr after the final application of the pesticide. No significant differences in the excretion or accumulation of 14CP was noted between the two groups.

**77-2772.** Coppage, D. L. ; Matthews, E. (U.S. EPA, Gulf Breeze Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561) **Short-term effects of organophosphate pesticides on cholinesterases of estuarine fishes and pink shrimp.** *Bull. Environ. Contam. Toxicol.* 11(5): 483-488; 1974. (28 references)

Detrimental effects of esterase-inhibition insecticides are investigated. Spot (*Leiostomus xanthurus*), pinfish (*Lagodon rhomboides*), Atlantic croaker (*Micropogon undulatus*), sheepshead minnows (*Cyprinodon variegatus*), and pink shrimp (*Penaeus duorarum*) were exposed to varying concentrations of malathion, sacrificed, and brain preparations (ventral nerve cord of shrimp) were made and assessed for inhibition of acetylcholinesterase (ACh) activity. Naled, guthion (azinphosmethyl), and parathion were also used with the spot and pinfish. Survivors of populations of fishes exposed to LC (40-60) of the various pesticides had mean brain ACh reductions of 70 to 96%. Comparison of ACh activity with controls demonstrated that the data was highly significant ($p < 0.001$). This study suggests that assay of ACh activity in addition to residue analysis would be very helpful in cause and effect studies of poisonings and fish kills in the environment.

**77-2723.** Chandler, J. H. ; Sanders, H. O.; Walsh, D. F. (S. E. Fish Control Lab., U. S. Bureau of Sport Fisheries and Wildlife, Warm Springs, GA) **An improved chemical delivery apparatus for use in intermittent-flow bioassays.** *Bull. Environ. Contam. Toxicol.* 12(1): 123-128; 1974. (5 references)

Design, construction, and operation of a metering device for use in intermittent-flow bioassays are presented. This device does not require the use of a Mariotte bottle, and is designed to replace the bothersome matering devices found on existing intermittent-flow systems. It is easily adapted for use on diluters, is free of moving parts, and can be rapidly constructed in the well-equipped laboratory. Delivery of toxicant is varied by simply changing the volume of the device. This delivery apparatus is inexpensive, accurate, and requires minimal maintenance.

**77-2724.** Stein, V. B. ; Pittman, K. A. (Inst. Comparative and Human Toxicol., Albany Med. Ctr., Albany, NY 12208) **Identification of a Mirex metabolite from monkeys.** *Bull. Environ. Contam. Toxicol.* 18(4): 425-427; 1977. (4 references)

Two 24-hr fecal samples were collected from adult rhesus monkeys receiving 1.0 mg Mirex/kg/day p.o. The samples were extracted with acetonitrile, partitioned into hexane, cleaned up by liquid chromatography, re-extracted with hexane, and analyzed by gas-liquid chromatography, mass spectrometry, and high pressure liquid chromatography. The data confirmed the presence of a monohydro derivative of Mirex in the fecal extracts. The metabolite was identified as either the 10-monohydro or 9-monohydro derivative of Mirex. The 9-monohydro derivative of Mirex has not been synthesized and was therefore not available for comparison.

**77-2725.** Lorgue, G. ; Delatour, P.; Courtot, D.; Cheippe, R. (Ecole Nat. Vet. Lyon, 69337 Lyon Cedex 1, France) **Etude de la toxicite du chlorophacinone, raticide antiocoagulant, sur le Canard milouin. [Toxicity of chlorophacinone, an anticoagulant rodenticide, on pochards.]** *Bull. Soc. Sci. Vet. Med. Comp. Lyon* 77(5): 307-314; 1975. (French)

The toxicity of chlorophacinone was studied in young male and female pochards. The birds refused to eat carrot bait treated with chlorophacinone, even if they had nothing else to feed on. However, they ingested wheat treated with this rodenticide, and some animals died as a result. Ten pochards were given single oral doses of chlorophacinone (7.5-25 mg/kg); none died. Two other birds were given 37.5 mg/kg doses; one of them died after 3 days. Six animals received daily doses of 7.5 mg/kg on 3 consecutive days; one of them died 4 days after the last dose. Ten pochards were treated with daily doses of 7.5 mg/kg for up to 9 days; all animals died between the 5th and 9th days. Hemorrhage in the commissure of the beaks, disturbed gait, and weight loss were the symtpoms of poisoning. Degeneration of the liver, pulmonary, pericardiac and abdominal effusions of blood, and subcutaneous hemorrhages in the breastbone area were seen on autopsy. The analysis of organ and tissue samples from birds that died after repeated administration of chlorophacinone showed residue levels of 0.55-5.96 ppm in the liver, 0.32-1.70 ppm in the kidney, 0.13-0.85 ppm in the breast muscle, 0.16-0.76 ppm in the abdominal fat, 0.35-15.12 ppm in the gizzard content, and 1.23-9.91 ppm in the intestinal content.

**77-2726.** Courtot, D. ; Delatour, P.; Lorgue, G.; Pitois, M. (Serv. Toxicol., Ecole Natl. Vet., 69337 Lyon Cedex 1,

France) **Dosage des reidus de dimethyl-2-2-dichlorvinyl-phosphate (Dichlorvos) chez le porcelet. [Qualtitative analysis of dichlorvos residues in the piglet.]** *Bull. Soc. Sci. Vet.Med. Comp. Lyon* (2): 137-140; 1976. (6 references) (French)

Three weaned piglets weighing 15 kg received single oral doses of 60 mg/kg DDVP (twice the dose recommended by the manufacturer), and various organs and tissues (blood, urine, bile, liver, kidney, muscles, gastric content, brain and fat) were analyzed 24 hr later for DDVP (dichlorvos) residues by means of a gas chromatography with electron capture detector at a sensitivity of 3 ppb. No DDVP residues were detected in any of the samples investigaed 24 hr after the treatment. (The analyses did not cover possible metabolites.) The findings indicate the very rapid metabolism of DDVP in piglets, and that the meat of piglets is safe for human consumption 24 hr after treatment with DDVP.

**77-2727.** Lorgue, M. ; Delatour, P.; Courtot, D.; Gastellu, J.; Dupas, J. C. (Lab. Toxicol., Ecole. Natl. Vet., Lyon, France) **Recherches sur les effects toxiques sur la caille des residus de carbaryl, insecticide du groupe des carbamates. [Study of the toxic effects of carbaryl, a carbamate insecticide, in the quail.]** *Bull. Soc. Sci. Vet. Med. Comp. Lyon* (3): 187-192; 1976. (22 references) (French)

The general toxicity and residue levels of carbaryl were studied in male and female quails. Group 1 received grains containing 20 ppm carbaryl *ad libitum* for 28 days. Group 2 received the same carbaryl-containing feed during the first 7 days of the experiment, and agains for 14 days from the 14th till the 28th day. The investigation of such physiological parameters as feed uptake, weight gain, behavior, general health status, mortality, egg-laying performance, and the histological examinations of the liver, kidney, ovaries and testicles revealed no changes compared with the control. The cholinesterase activity of the erythrocytes was practically the same as in the control. The findings indicate that 20 ppm carbaryl ingested in feed has no toxic effect on quails. The carbaryl residue levels in the liver were 0.10 ppm on day 21, 0.20 ppm on day 28, and 0.84 ppm on day 35 in group 1, while residues (0.15 and 0.11 ppm, respectively) were detected only on days 21 and 28 in group 2. No carbaryl was found in the intestinal content. The residue level was about 5 ppm in the gizzard content.

**77-2728.** Roszkowski, J. ; Zadura, J.; Skwarek, P. (Dep. Pathol. Anat., Vet. Res. Inst., Pulawy, Poland) **The effect of chlorfenvinphos on immune response in chickens.** *Bull. Vet. Inst. Pulawy* 19(1-2): 37-41; 1975. (9 references)

The effect of chlorfenvinphos on immune responses in chickens was investigated. Chickens were given single or repeated doses of chlorfenvinphos (50 mg/kg) and immunized with sheep erythrocytes. The results demonstrated that the organophosphorus compound used in these experiments produced clinical symptoms characteristic of inhibition of cholinesterase activity, but did not depress the ability to produce antibodies to sheep erythrocytes. It is noted that the compound administered in a single dose seemed to exert the immune responses. These studies corroborated the suggestion that there is a linear correlation between cholinergia and immune responses. In view of this suggestion, the depression in the immune response noted in chickens dosed repeatedly is due to general emaciation of the organism under the influence of prolonged intoxication rather than to a direct action of the compound.

**77-2729.** Kuzminskaya, U. A. ; Berson, L. V.; Pismennaya, M. V. (All-Union Res. Inst. Hyg. Toxicol. Pestic, Poly. Plast., Kiev, USSR) **Aktivnost' fermenkov obmena glyukozo-6-fosfata v pecheni krys pri eksperimental'noi intoksikatsii valeksonom. [The activity of the enzymes of the glucose-6-phosphate metabolism in the liver of rats under experimental valekson intoxication.]** *Byul. Eksp. Biol. Med.* 84(12): 677-679; 1977. (Russian)

To assess the mechanism of valexon intoxication, the activities of glucose-6-phosphatase and glucose-6-phosphate dehydrogenase were measured in rat liver homogenates 1 hr, 1 day, and 5 days after a single oral dose of valexon. Increased activity and solubilization of glucose-6-phosphatase, activation of glucose-6-phosphate dehydrogenase, and inhibition of hexokinase activity in the liver preparations was observed; the maximum alternation of activity occurred 1 hr after administration. These results indicate that a decrease in the rate of glucose-6-phosphate formation is a factor in the development of valexon-induced intoxication.

**77-2730.** Halacka, K. ; Dvorak, M.; Rysanek, K.; Jagos, P.; Cerny, E. (Fac. Med. J. E. Purkyne Univ., Brno, Czechoslovakia) **Vliv malych peroralne podavanych davek heptachloru na ultrastrukturu jaternych bunek a jejich enzymove systemy u pokusnych zvirat. [The effect of small oral doses of heptachlor on the ultrastructure of hepatocytes and their enzyme systems in experimental animals.]** *Cesk. Hyg.* 20(6/7): 286-291; 1975. (8 references) (Czech)

The effects of 2 and 5 mg/kg oral doses of heptachlor on the ultrastructure of hepatocytes and on liver enzymes were studied in pigs, Wistar rats and sheep. The animals received heptachlor daily for 78-86 days. Microscopic examinations of the liver revealed sublobular necroses which progressed during the course of the experiment and were more pronounced in animals treated with the higher dose. These changes were especially marked in rats. The ultrastructural studies showed reduced glycogen content and relative proliferation of vesicles and smooth endoplasmic reticulum in the hepatocytes. At higher doses and after longer administration of heptachlor, lysosomes were found more frequently along with inconstant dilation of the cisterns of the smooth endoplasmic reticulum. Out of all of the enzymes investigated (glutamic-oxaloacetic transaminase, glutamic-pyruvic transaminase, leucine amino-peptidase, gamma-glutamyl transpeptidase, lactate dehydrogenase, alkaline phosphatase, alanine aminopeptidase, valine aminopeptidase, sorbitol dehydrogenase, and lipase) the lactate dehydrogenase activity showed a significant increase in all groups of experimental animals and is thus suitable as an index of damage.

**77-2731.** Tsorbatzoudi, E. ; Vockel, D.; Korte, F. (Inst. Chem. Tech. Univ. Muenchen, D-8050 Freising-Weihenstephan, Germany) **Metabolismus von Buturon-$^{14}$C in Algen. [Metabolism of buturon-$^{14}$C in algae.]** *Chemosphere* 5(1): 49-52; 1976. (13 references) (German)

The metabolism of $^{14}$C-buturon was studied in *Chlorella fusca* var. *rubra* cultures. Ninety-nine per cent of the radioactivity was recovered from the culture medium, and only 1% from the algae. Only traces of metabolites were found after incubation for 14 days, while the rate of metabolism was 30% after 28 days, at which time 6 different metabolites were found: metabolite I (8.7%, molecular weight 238); IIa+IIb (6.4%); III (4.2%), IV (4%) and V (6.5%). Splitting-off of the iso-butinyl radical, hydrogenation of the triple bond, and addition of methanol were observed. There were no volatile substances among the metabolites. The metabolism was exclusively due to the enzymatic activity of the algae. No degradation was observed in blank experiments without algae.

**77-2732.** Wong, M. H. ; Yew, D. T. (Dep. Biol., Chinese Univ. Hong Kong, Shitin, Hong Kong) **Dermotoxicity of the mosquito repellent related to rabbit ears.** *Acta Anat.* 100(1): 129-131; 1978. (5 references)

Mosquito repellent containing diethyltoluamide and dimethylphthalate was applied daily for 14 days to the shaved ears of albino rabbits. The treated skin was then compared histopathologically with untreated shaven skin from the ears of control rabbits. The treated skin showed an increase in infoldings and indentations on the skin surface, the infoldings being deep and covered by the epidermis. Some regions of the epidermis lining the infoldings showed a thinning out, and within the infolded areas cellular debris was often found. Some of the areas of skin were covered only with dermis and no epidermis. These areas were sometimes covered only by some keratinized layers, and white blood cells had migrated into the areas. The dermis of most infoldings was crowded with numerous fibroblasts which were aligned in layers in between collagens. The fibroblasts appeared to be involved in the production of the collagens. Cystic dilations were sometimes observed in the dermis. The dilations were closed to the epidermis, surrounded by inflammatory cells, and contained eosinophilic fluid. It is unknown whether the effects observed were caused by dimethylphthalate or one of the isomers of diethyltoluamide or by the synergistic effect of both.

**77-2733.** Jensen, S. ; Kihlstrom, J. E.; Olsson, M.; Lundberg, C.; Orberg, J. (Natl. Swedish Environ. Protect. Board, Spec. Anal. Lab., Wallenberg Lab., Stockholm, Sweden) **Effects of PCB and DDT on mink (*Mustela vision*) during the reproductive season.** *Ambio* 6(4): 239; 1977. (7 references)

To determine whether heavy pesticide contamination of the Baltic area may be responsible for the decrease in the Baltic seal populations, the effects of DDT and PCB on mink (*Mustella vision*) were studied. The number of whelps per bitch was not reduced by up to 66 daily doses of DDT (11 mg/dose), whereas 22 doses of PCB (11 mg/dose) did decrease the number of whelps per bitch. In a second experiment, bitches were given feed containing 0.05 ppm PCB (controls), 5 times the amount of PCB found in Baltic herring (3.3 ppm) plus 3.3 ppm DDT, or 15 times the amount of PCB found in Baltic herring (11 ppm). The feeding schedule was begun 1 mon before mating and continued for 66 consecutive days. The relative liver weights were higher in the bitches given the larger concentrations of PCB than in the controls. The frequencies of match and pregnant bitches did not vary between the three groups, but the number of delivering bitches, number of whelps per bitch, weight of the whelps, and percentage of whelps living after 5 days was lower in the group given 3.3 ppm PCB than in the controls; the number of stillbirths was higher in the 3.3 ppm group than in the controls. No whelps were born in the 11 ppm group. The hepatic cytochrome P 450 and renal cadmium concentrations were significantly higher in the 3.3 and 11 ppm groups than in the controls.

**77-2734.** Hart, R. W. ; Hays, S.; Brash, D.; Daniel, F. B.; Davis, M. T.; Lewis, N. J. (Comprehensive Cancer Res. Cent., Ohio State Univ., Columbus, OH 43210) **In vitro assessment and mechanism of action of environmental pollutants.** *Ann. NY Acad. Sci.* 298: 141-158; 1977. (94 references)

Development of a bioassay prescreen that would permit direct determination of DNA damage induced by environmental pollutants, and DNA repair in both mitotic and nonmitotic cells and in specific tissues of the test organism is discussed. The assay measures only the form of DNA damage that involves removal and reinsertion of new bases. In one technique, matched cultures are labeled with either $^{3}$H-thymidine or $^{32}PO_4$, exposed to the test reagents, incubated in either cold radiolabeled thymidine or bromodeoxyuridine for varying periods of time, mixed, exposed to varying fluences of light, lysed, and sedimented in alkaline sucrose gradients. Other techniques are presented, and much progress has been made toward the development of an in vivo assay.

**77-2735.** Goerz, G. ; Krieg, T.; Bolsen, K.; Lissner, R. (Univ.-Hautklinik Dusseldorf, D-4000 Dusseldorf, Germany) **Langzeit-Exposition von Ratten mit Hexachlorobenzol (HCB): Einfluss auf die porphyrin-Ausschiedung im Urin und aut das Cytochrom P-450 in der Leber. [Long term HCB exposure of rats: Influence on porphyrin excretion in the urine and on cytochrome P-450 in the liver.]** *Arch. Dermatol. Res.* 259(2): 199-206; 1977. (23 references)

To assess the relationship between enzyme induction in the liver and the porphyria following hexachlorobenzene (HCB) application, adult female Wistar rats were fed a diet containing 0.05% HCB. An increase in the porphyrin precursors δ-aminolevulinate (ALA) and porphobilinogen (PBG) was observed in the rats 55 days after HCB application; however, no qualitative changes in the cytochrome P-450 pattern could be noticed.

**77-2736.** Schoene, K. ; Steinhanses, J.; Oldiges, H. (Inst. Aerobiol., Fraunhofer-Gesellschaft, Schmallenberg-

Grafschaft, Germany) **Protection against organophosphate poisoning in vivo and inhibition of choline-acetyltransferase in vitro.** *Biochem. Pharmacol.* 26(19): 1821-1823; 1977. (11 references)

Various pyridinium salts were injected i.m. into female NMRI mice and 5 min later a $LD_{95}$ of soman (0.280 mg/kg) was administered s.c. In other experiments, the abilities of the various pyridinium compounds to inhibit rat brain choline-acetyltransferase (ChAc) in vitro were determined. The pyridinium oxides HH 13 and HH 14 proved to be the best protectors against intoxication by the organophosphate in vivo, whereas in vitro these compounds showed no measurable inhibitory activity toward ChAc. The most potent in vitro inhibitors of ChAc, HH 59 and HH 30, offered no protection against soman intoxication in vivo. In general, the in vivo protection afforded by the pyridinium salts against soman increased as their in vitro inhibitory activity toward ChAc decreased. The data indicate that the protective effects of the pyridinium salts against soman in vivo are not caused by ChAc inhibition. It is unknown whether the protection against soman intoxication afforded by 4-(α-naphthylvinyl) pyridinium is related to its ability to inhibit ChAc.

**77-2737.** Iverson, F. (Bureau Chem. Safety, Foods Directorate, Health Protect. Br., Ottawa, Ontario, Canada) **Inhibition and regeneration of rat liver enzymes hydrolyzing acetanilide and *O*-nitrophenyl butyrate.** *Bull. Environ. Contam. Toxicol.* 18(4): 466-471; 1977. (10 references)

Male Sprague-Dawley rats were given a single i.p. injection of malathion (85 mg/kg), parathion (1 mg/kg), diazinon (12 mg/kg), guthion (azinphosmethyl, 1 mg/kg), sumithion (Fenitrothion, 20 mg/kg), methomyl (2 mg/kg), carbaryl (16 mg/kg), temik (aldicarb, 0.25 mg/kg), mobam (11 mg/kg), baygon (aprocarb, 8 mg/kg), or vehicle alone (controls). In each case, the dose of insecticide was equal to one quarter of the $LD_{50}$. The animals were sacrificed at various times after dosing and liver homogenates were prepared. The *o*-nitrophenyl butyrate ratio of (ONPB) to acetanilide inhibition varied from 0.3 to 3.3, suggesting that both activities did not result from a single enzyme site. In vivo, both enzyme activities returned to control levels 6 hr after carbaryl administration; the data are consistent with a half-life of approximately 1.5 hr. In vitro at 25°C, the half-life was approximately 6.5 hr. The acetanilide amidase activity in vitro declined rapidly during the first hr after carbaryl administration to 50% of the control value. The data indicate that only the most acute interactions between an *N*-methyl carbamate and acetanilide would be of toxicological significance, and that carboxylesterase activity is more closely related to serum cholinesterase than erythrocyte acetylcholinesterase.

**77-2738.** Neskovic, N. K. ; Vitorovic, S. L. (Dep. Pestic. INEP, Baranjska 15, Zumun, Yugoslavia) **The effect of banol and paraoxon on the NADPH-cytochrome c reductase activity and cytochrome P-450 content in rats.** *Bull. Environ. Contam. Toxicol.* 18(4): 472-477; 1977. (10 references)

Female rats were treated i.p. with banol (2 mg/kg) or paraoxon (0.03 mg/kg) 2 hr before sacrificing. In some cases, phenobarbitone (80 mg/kg) was injected 48 and 24 hr before sacrificing. NADPH-cytochrome c reductase activity, cytochrome P-450, and microsomal proteins were estimated in liver microsomal preparations from the treated animals. Banol reduced the activity of NADPH-cytochrome c reductase and the concentration of cytochrome P-450, while paraoxon reduced the activity of NADPH-cytochrome c reductase, but increased the concentration of cytochrome P-450. Phenobarbitone alone stimulated the increases in NADPH-cytochrome c reductase activity and cytochrome P-450 concentration. When combined with banol or paraoxon treatment, phenobarbitone reduced the inhibitory effects of the pesticides.

**77-2739.** Paulov, S. (Dep. Gen. Zool. Animal Physiol., Faculty Nat. Sci., Comenius Univ., Bratislava, Czechoslovakia) **The effects of *N*-phenyl- *N'*-methyl urea (defenuron) on the development of amphibia (*Rana temporaria* L.).** *Biologia (Bratislava)* 32(8): 607-611; 1977. (10 references)

To assess the effects of *N*-phenyl- *N'*-methyl urea (Defenuron) on the development of tadpoles of the frog *Rana temporaria L*, two-day-old tadpoles were bred in aquariums contaminated with 100 ppm Defenuron. The in vitro effects of Defenuron were assessed in a series of experiments in which methylcholanthrene-induced tumor cells in female rats were cultured in medium contaminated with 0.025, 0.25, and/or 2.5 ppm Defenuron. Defenuron induced a significant multiplication of the cells in vitro. The effects of Defenuron on the tadpoles were numerous: death of 10% of the tadpoles; development of giant tadpoles without forelegs which survived (40%); incomplete metamorphosis and death before complete resorption or the tail (10%), complete metamorphosis of frogs with survival (40%). These studies point to the potentially dangerous side effects of the herbicide Defenuron on non-target organisms.

**77-2740.** Crump, K. S. ; Guess, H. A.; Deal, K. L. (Dept. Math., Louisiana Tech, Univ, Ruston, LA 71272) **Confidence intervals and test of hypotheses concerning dose response relations inferred from animal carcinogenicity.** *Biometrics* 33(3): 437-451; 1977. (18 references)

The development of confidence intervals and hypothesis tests from dichotomous data of animal carcinogenicity experiments for dose-response relations is presented. The dose-response curve is derived from the Armitage-Doll multistage carcinogenesis model, and involves a polynomial in the dose rate with non-negative coefficients. Confidence bounds on risk at a given dose and on the dose corresponding to a given risk are constructed from asymptotic distributions of the maximum likelihood estimators of these coefficients. Likelihood ratio tests are developed to test for the presence of a positive dose-related effect, and for the existence of a positive slope of the dose-response curve at zero dose. A positive slope at zero dose rules out any threshold-like behavior, and could mean that any dose low enough to insure negligible cancer risk would be too low for applications such as food

additives. The statistical application of this model should be useful not only in analyzing animal carcinogenicity data, but perhaps more importantly, in helping to improve the statistical design of such experiments during the planning stages.

**77-2741.** Toth, B. ; Wallcave, L.; Kashinath, P.; Schmeltz, I.; Hoffman, D. (Eppley Inst. Res. Cancer, Univ. Nebraska Med. Cent., Omaha, NB 68105) **Induction of tumors in mice with the herbicide succinic acid 2,2-dimethylhydrazide.** *Cancer Res.* 37(10): 3497-3500; 1977. (23 references)

To assess the tumorigenicity of succinic acid 2,2-dimethylhydrazide (SADH), a 2% SADH solution was given continuously in the drinking water of 6-wk-old randomly bred Swiss albino mice at the maximum tolerated dose for the remainder of their lives. The incidence of tumors of the blood vessels, lungs, and kidneys were 6, 18, and 0%, respectively, in controls; and 73, 73, and 5% in the SADH treated mice. Histologic examination revealed typical angiomas and angiosarcomas of blood vessels, adenomas and adenocarcinomas of lungs, and adenomas of kidneys. This study demonstrates the tumorigenicity of the herbicide SADH, which occurs as residues on fruits marked for human consumption. The implications of this finding, and the carcinogenicity of hydrazines as a class are discussed.

**77-2742.** Suguira, K. ; Sato, S.; Goto, M. (Dep. Chem., Gakushuin Univ., Tokyo, Japan) **Effects of β-BHC on aquatic microcosm.** *Chemosphere* 5(1): 39-44; 1976. (15 references)

To study the effects of β-BHC induced stress on an aquatic microcosm, a culture medium (200 ml) containing polypeptone (0.01%) and inorganic substances was placed in a conical flask to which was added Bacteria (at least 5 species), Ciliata (*Cyclidium*), Rotifera (*Philodina* and *Lepadella* ), an unidentified species of aquatic oligochaeta, green algae (*Chlorella* and *Scenedesmus*), and blue-green algae. Counts of organisms, total biomass, dissolved oxygen, and multiplication were determined for the organisms in the community at 0, 0.1, 1, and 5 ppm β-BHC. A relation exists between the concentration of β-BHC in the organism at equilibrium organisms and the concentration of β-BHC in a culture medium. No decomposition of β-BHC was observed in this system. Changes in the gross primary productivity due to further stress from *p,p'*-DDT and 2,4,5-T were also investigated. These results suggest that studies of this type, in which the relative intensity of a stress added to a microcosm is evaluated by deviation of the community metabolism, can be useful in evaluation of the effects of toxic chemicals on the natural ecosystem.

**77-2743.** El-Oshar, M. ; Dauterman, W. C. (Toxicol. Prog., Dep. Entomol., North Carolina State Univ., Raleigh, NC 27607) **Studies on the metabolism of formothion.** *Chemosphere* 6(9): 531-536; 1977. (7 references)

The mechanism by which formothion is deformylated was studied. Incubation of $^{14}$C-formothion with 10,800 *g* supernatant, 100,000 *g* supernatant (soluble fraction), and microsomal fractions from rat liver at 37°C and pH 7.4 resulted in metabolism of all of the formothion within 30 min. The formotion of the two metabolites, dimethoate and dimethoate monoacid, was not dependent on enzymatic oxidation or reduction reactions. No dimethoxon was found in the reaction mixture. The rate of formation of dimethoate and dimethoate monoacid was much slower at lower pH than at alkaline pH. Since various cations had little effect on the breakdown of formothion, the degradation appeared to be primarily dependent on the pH of the solution. The amounts of the two metabolites were approximately equal at pH's above 7.0 and it is likely that deformylation and deamidation occur by nonenzymatic base hydrolysis. In that the cell juices of plants are generally acidic and the physiological pH of many mammalian tissues and fluids is about 7.4, it would be expected that formothion would be more persistent in plant residues and less stable in mammal tissues. It would be unlikely to find formothion residues in mammals.

**77-2744.** Giardina, M. C. ; Buffone, R. (Radiobiochem. Plant. Ecophysiol., Lab., Natl. Res. Council Italy Rome, Italy) **Pathway of initial prometryn degradation by a soil bacteria.** *Chemosphere* 6(9): 589-594; 1977. (15 references)

A population of soil bacteria able to effectively degrade prometryn was developed using an enrichment technique. The microorganism was classified as an *Agrobacter radiobacter*, and it utilized prometryn as a soil source of nitrogen, carbon, or both. Growth of the bacteria was significantly greater when glucose was added as a supplemental source of carbon, whereas nitrogen had no such effect. No growth was observed in media with no nitrogen source or with no carbon source. Growth on prometryn in batch culture was diauxic, prometryn being metabolized during the first growth phase and cellular lysis occurring during the diauxic lag. Two of the three prometryn metabolites produced during the first exponential growth phase were identified as 2-methylthio- 4-ethylamino- 6-isopropyl- amino-*s*-triazine and 2-methylthio-4-amino- 6-isopropylamino- *s*-triazine; the third metabolite was not identified. The degradation of prometryn proceeded by initial attack on the 4 side-chain, and it is suggested that the other side chain was subsequently metabolized, leaving the triazine ring intact. The results support the hypothesis that methylthio-s-triazines can be degraded via *N*-dealkylation by soil microorganisms. Dealkylation of *s*-triazine herbicides does not necessarily insure detoxication, however.

**77-2745.** Johnson, C. R. ; Prine, J. E. (Div. Biol. Control, Univ. California-Berkeley, Albany, CA 94706) **The effects of sublethal concentrations of organophosphorus insecticides and an insect growth regulator on temperature tolerance in hydrated and dehydrated juvenile western toads, *Bufo boreas* .** *Comp. Biochem. Physiol.* 53(A): 147-149; 1977. (23 references)

Hydrated and dehydrated juvenile western toads ( *Bufo boreas*) were exposed for 24 hr to sublethal concentrations of the organophosphorus insecticides Abate, (temphos,

fenthion, chlorpyrifos-methyl, chlorpyrifos-ethyl, methyl parathion, and the insect growth regulator, Altosid (methoprene). The most pronounced reduction in temperature tolerance occurred with the exposure to the insecticide fenthion; exposure to Altosid caused the least reduction in temperature tolerance. In most cases the temperature tolerances of the dehydrated toads were not lowered significantly, and in some cases were higher than toads exposed in the hydrated condition to the same chemical and concentration suggesting that dehydrated toads were metabolizing the chemicals at a greater rate than hydrated animals. The thermal tolerance was lowered significantly by all chemicals tested against concentrations at least one-half the usual field concentrations. Control toads were more active than any of the treated individuals suggesting that other physiological responses were also affected. (Author abstract by permission)

**77-2746.** Srinivasan, K. ; Radhakrishnamurty, R. (Discipline Biochem. Appl. Nutr. Cent. Fd. Technol. Res. Inst., Mysore, India) **Effect of $\beta$ and $\gamma$ isomers of hexachlorocyclohexane on some liver and kidney enzymes in albino rats.** *Curr. Sci.* 46(17): 598-600; 1977. (18 references)

Weanling male rats were maintained for 14-18 days on diets containing no pesticide (controls) or 800 ppm of $\beta$ -BHC or $\gamma$-BHC. The animals were observed for 2 weeks and sacrificed during the third week. Protein and the activities of alanine and asparatate 2-oxoglutarate aminotransferase, alkaline and acid phosphatase, glucose-6-phosphatase, and glucose-6-phosphate dehydrogenase in the liver and kidney tissues were determined. During the third week, $\beta$-BHC produced signs of severe toxicity culminating in coma and death; it produced no growth retardation. $\gamma$-BHC produced loss of apetite and growth retardation during the first week only. $\beta$ -BHC produced significant increases in hepatic alanine aminotransferase (80%), the renal alkaline and acid phosphatase (125% and 35%, respectively), and hepatic glucose-6-phosphate dehydrogenase (130%), and significant decreases in hepatic aspartate aminotransferase (30%), renal alanine aminotransferase (35%), the hepatic alkaline and acid phosphatases (45% and 40%, respectively), and hepatic glucose-6-phosphatase (30%). $\gamma$-BHC produced significant increase in hepatic alanine aminotransferase (50%), renal acid phosphate dehydrogenase (40%), and significant decreases in hepatic aspartate aminotransferase (30%) and the hepatic alkaline and acid phosphatases (35% each).

**77-2747.** Nakas, J. P. (Rutgers Univ., State Univ. New Jersey, New Brunswick, NJ) **Chlordane inhibition of endopeptidase activity in the marine bacterium *Aeromonas proteolytica*.** *Diss. Abstr. Int. B.* 38(2): 77; 1977.

The inhibition by chlordane of an extracellular endopeptidase secreted by the marine bacterium *Aeromonas proteolytica* was studied. The extracellular endopeptidase, but not the extracellular aminopeptidase, was sensitive to chlordane inhibition. The insecticide was not degraded by *A. proteolytica* and up to 75% of the recoverable chlordane was associated with whole cells within 48 hr. Protein and RNA synthesis were not inhibited by chlordane. Isopycnic centrifugation in 35-55% (wt/wt) sucrose gradients separated the crude membrane fraction of *A. proteolytica* into three fractions: enriched cytoplasmic membrane, a hybrid fraction containing both cytoplasmic and outer membrane, and enriched outer membrane. Over 60% of the chlordane present in the gradient was detected in the cytoplasmic membrane fraction. Protein patterns in SDS polyacrylamide gels showed quantitative differences for both cytoplasmic and outer membrane fractions. Chlordane inhibited the membrane-bound ATPase of A. proteolytica but had little effect on the soluble enzyme. Also, a correlation was established between loss of endopeptidase activity and decreased cAMP levels. Inhibition of a membrane-bound ATPase as well as a possible membrane-bound adenyl cyclase provided a model of chlordane inhibition which includes solubilization of chlordane in the cytoplasmic membrane. From this location, the insecticide could conceivably inhibit the synthesis of endopeptidase and ATPase mediated transport through the cell wall. (Author abstract by permission. Abridged copies of these are available from University Microfilms, Order No. 77-17,554.)

**77-2748.** Shabarchin, E. I. ; Krugljakova, K. E.; Lendel', L. Ya. (Inst. Chem. Phys., USSR Acad. Sci., Moscow, USSR) **O vozmozhnosti ispol'zovaniya biologicheskikh membran v kachestve modelei dlya otsenki biologicheskoi aktivnosti pestitsidov. [Use of biological membranes as models for evaluating biological activity of pesticides.]** *Dokl. Akad. Nauk SSSR* 234(2): 490-492; 1977. (4 references) (Russian)

The effects of phosmet, prometryne, atrazine, desmetryne, and trichlorfon on the functional activity of bull heart submitochondrial particles were studied by spectrophotometric determination of the NAD-H oxidase activity. Increasing concentrations of the pesticides caused monotonical increasing inhibition of the NAD-H oxidase activity. The concentration dependence of the activity can be described by an exponential function. The pesticide concentrations causing 50% inhibition are 7.5 $\mu$M for phosmet, 145 $\mu$M for prometryne, 430 $\mu$M for atrazine, 700 $\mu$M for desmetryne, and 5,000 $\mu$M for trichlorfon. The findings indicate the possibility of using biological membranes as a model in studies on the biological activity of pesticides.

**77-2749.** Martz, F. ; Straw, J. A. (Dept. Pharmacol., George Washington Univ. Med. Cen., Washington, DC 20037) **The in vitro metabolism of 1-(*o*-chlorophenyl) -1- (*p*-chlorophenyl)-2,2-dichloroethane (*o,p'*-DDD) by dog adrenal mitochondria and metabolite covalent binding to mitochondrial macromolecules. A possible mechanism for the adrenocorticolytic effect.** *Drug. Metab. Disposit.* 5(5): 482-486; 1977. (20 references)

Metabolism and metabolite covalent binding of *O,P'*-DDD (TDE) in the adrenals of dogs were investigated. Mongrel dogs, 12-20 kg, were sacrificed and adrenal fractions were prepared and incubated in solution containing $^{14}$C-labeled TDE. After incubation the preparations were analyzed using thin-layer chromatographic and scintillation

techniques. Adrenal mitochondria metabolized $^{14}$C-TDE at a rate of 31.67 ± 1.87 nmol/mg protein/30 min in vitro to five polar products. The microsomal and soluble fractions were inactive. Denaturation of enzymes prior to incubation or failure to add NADP+ to the incubation mixture drastically reduced both metabolism and covalent binding of TDE. These results suggest a significant role of the adrenals in xenobiotic metabolism.

**77-2750.** Kroschenko, V. P. ; Place, T. A. (Dept. Biol. Sci., Univ. Idaho, Moscow, ID 83843) **Prolonged effects of kepone on strength and thickness of eggshells from Japanese quail fed different calcium level diets.** *Environ. Pollut.* 13(4): 255-264; 1977. (23 references)

The effects of prolonged intake of heavy doses of kepone (chlordecone) on the quality of Japanese quail eggs, and on the longevity of the quail during extreme calcium deficiency followed by a similar period of adequate calcium intake were assessed. One group of Japanese quail (*Coturnix japonica*) were fed low- and then high-calcium diets for 120 days each. A second group of quail received the same feeding schedule plus the addition of 200 ppm kepone in the diet. Continued kepone feeding resulted in significant thinning and weakening of the eggshell along the vertical and horizontal axes; these effects were more pronounced with the high-calcium diet. Increased egg breakage and high mortality were characteristic. Kepone-fed quail that ceased egg laying exhibited neurological disorders and died. By the end of the experiment over 60% of all eggs laid were broken and over 90% of the kepone-fed quail were dead; 30 days after the experiment, all of the kepone-fed birds were dead.

**77-2751.** Waters, E. M. ; Huff, J. E.; Gerstner, H. B. (Toxicol. Inform. Response Center, Inform. Div., Oak Ridge Lab., Oak Ridge, TN 37830) **Mirex. An overview.** *Environ. Res.* 14(2): 212-222; 1977. (56 references)

Mirex, a chlorinated insecticide, is the active ingredient in bait used to control the imported fire ant. Prepared in 1946, mirex was first introduced for use in pesticidal formulations in 1959; mirex acts as a stomach poison. Extreme persistence in the natural environment provides an opportunity for accumulation in the food chain. No metabolism of mirex appears to take place in mammalian systems, although mirex causes liver damage and has been reported to produce hepatomas in mice. Mirex readily crosses the rat placental barrier; while no teratogenic effects are apparent, reduced litter size and a high incidence of cataracts in the offspring have been reported. An abstracted literature collection spanning the years 1947 to 1976 of 325 references has been published by Waters and Black (1976). (Author abstract by permission.)

**77-2752.** Puzunska, L. (Inst. Food Nutr., 02-903 Warsaw, Poland) **The effect of propoxur on rats fed diets differing in protein content.** *Environ. Res.* 14(1): 152-163; 1977. (36 references)

In 6-wk-old Wistar rats fed for 30 and 93 days either 4.5 or 26% casein diets containing 0, 500, 1,500, 4,500, and 9,000 ppm of propoxur several biological changes were found which were more pronounced when propoxur was added to low-protein diet for 93 days, particularly in concentrations of 4,500 and 9,000 ppm. The changes were as follows: (1) in the liver--decreased activity of aromatic amino acids aminotransferases (AAA) and β-glucuronidase (β-GR) as well as diminished protein content in supernatant; unchanged activity of aspartate aminotransferase (AspAT), glucosephosphate isomerase (PHI) and fructosediphosphate aldolase (ALD); (2) in the serum--decreased activity of acetylcholinesterase (AChE) as well as β-GR and increased PHI activity; unaltered activity of ALD and sorbitol dehydrogenase, (SDH); (3) in the brain--decreased activity of AChE, PHI, ALD, AAA, reduced protein content in supernatant; unchanged activity of AspAT and biogenic amines level; (4) decreased rate of rat body weight gain on contaminated normoprotein diet and weight loss on contaminated low-protein diet; (5) changes in the relative weight of certain internal organs; no detectable anatomical changes in the examined organs. The acute oral toxicity of propoxur was definitely enhanced by the previous feeding of low-protein diet: 1.7 times in males and 1.3 times in females after 30 days, and after 93 days 4.3 and 2.7 times, respectively.

**77-2753.** Conaway, C. C. ; Madhukar, B. V.; Matsumura, F. (Dept. Entomol., Univ. Wisconsin, Madison, WI 53706) ***p,p'*-DDT: Studies on induction mechanisms of microsomal enzymes in rat liver systems.** *Environ. Res.* 14(2): 305-321; 1977. (40 references)

Evidence is presented to show that induction of protein synthesis by *p,p'*-DDT in the rat liver specifically occurs at the level of translation. Such a DDT-induced change is not accompanied by the gross increase in ribosomal RNA, or in the rate of microsomal phosphorylation from [γ—$^{32}$P]ATP. Actinomycin D and α-amanitin, which inhibit RNA synthesis, had no effect on induction of cytochrome P-450. It appears that *p,p'*-DDT is very specific in its induction mechanism, acting largely on the initiation and elongation processes of protein synthesis at the ribosomal level.

**77-2754.** Kimmel, C. A. (Natl. Inst. Environ. Health Sci., Research Triangle Park, NC 27709) **Behavioral teratology: overview.** *Environ. Health Perspect.* 18: 73; 1976. (8 references)

The field of teratology has expanded in recent years to include the study of the effects of prenatal insults on the behavior of animals after birth. There is some indication that behavioral changes can be produced at dosage levels below that producing overt toxicity. Some pesticides have recently been tested for behavioral teratology. Although the use of behavioral tests as an integral part of the screening of new chemical agents is being discussed in the United States, a great deal of work must first be done to develop adequate testing systems and the resources required to carry out such testing. This work will require a concerted effort by industry, academia, and the government. The implications of test results for man will probably be as difficult to evaluate as for

other aspects of toxicology, but must be given serious consideration in developing new test systems.

**77-2755.** Petres, J. ; Baron, D.; Hagedorn, M. (Dept. Clin. Exp. Dermatol., Univ. Freiburg i. Br., W. Germany) **Effects of arsenic on cell metabolism and cell proliferation: cytogenetic and biochemical studies.** *Environ. Health Perspect.* 19: 223-227; 1977. (28 references)

Cytogenetic, radioactive incorporation, and cytophotometric studies were performed on the chromosomes of lymphocytes from patients who had been exposed to arsenic and on chromosomes of lymphocytes from healthy volunteers exposed in vitro to sodium arsenate at 0.1-500 μg/ml culture medium. Arsenic was shown to inhibit in a dose dependent manner, the incorporation of radioactive nucleotides into DNA and RNA and block cells in the S and $G_2$ phase. Chromosome pulverizations were observed in extreme cases in both experimental groups. Arsenic toxicity is due to the strong affinity of arsenic for enzymes, especially those containing sulfhydryl groups.

**77-2756.** Stevens, J. T. ; Hall, L. L.; Chernoff, N.; Farmer, J. D.; Durham, W. F.; DiPasquale, L. C. (Environ. Toxicol. Div. Environ. Prot. Ag., Research Triangle Park, NC 27711) **Disposition of $^{14}$C and/or $^{74}$As-cacodylic acid in rats after intravenous, intratracheal, or peroral administration.** *Environ. Health Perspect.* 19; 151-157; 1977. (10 references)

To study the distribution, excretion, and metabolism of cacodylic acid the $^{14}$C and/or $^{74}$As labeled organoarsenical herbicide was given to male Sherman rats by iv injection, intratracheal instillation, or oral gavage at dose levels between 120 μg/kg and 200 mg/kg. Absorption of cacodylic acid was greater in the lung than in the gastrointestinal tract. Plasma and tissue levels were similar after all three routes of administration, but concentrations observed in the liver and whole blood were higher after peroral than after iv administration. Excretion of cacodylic acid was very rapid; 70%, 60%, and 25% respectively was excreted in the urine following iv, intratracheal, and po administration. Kinetic analysis of $^{14}$C cacodylic acid at the highest dose revealed three half-times, 0.014, 0.214, and 3.42 hr, with an apparent distribution volume of 15.3 ml. RBC were found to be the major body burden site of cacodylic acid. No sex related differences were found in the distribution of cacodylic acid, but the acid can pass through the placental barrier just prior to parturition, achieving fetal blood levels comparable with those of the parent.

**77-2757.** Reuber, M. D. (11014 Swansfield Rd., Columbia, MD 21044) **Histopathology of carcinomas of the liver in mice ingesting heptachlor or heptachlor epoxide.** *Exp. Cell. Biol.* 45(3-4): 147-157; 1977. (13 references)

The histopathology of carcinomas of the liver from C3H male and female mice fed heptachlor or heptachlor epoxide, 10 ppm in the diet, is studied. Liver carcinomas were seen in 121/165 mice ingesting heptachlor, and 150/160 ingesting heptachlor epoxide, while 24/126 control mice developed hepatic carcinomas. Liver carcinomas in the experimental animals were usually multiple and measured 3-5 cm in diameter, whereas the carcinomas in the control mice were usually solitary and measured less than 5 mm. The carcinomas varied from well-differentiated to poorly-differentiated and undifferentiated, and were capable of invasion and metastasis.

**77-2758.** Hasan, M. ; Bajpai, V. K.; Shipstone, A. C. (Brain. Res. Lab., Dept. Anat., J. N. Med. Coll., Aligarh, India 202001) **Electron microscopic study of thallium induced alterations in the oligodendrocytes of the rat area postrema.** *Exp. Pathol. (Jena)* 13(6): 338-345; 1977. (25 references)

The effect of thallium on the area prostrema was studied by electron microscopy. Male albino rats (155-175 g) were injected with 5 mg/kg thallous acetate, ip, for 7 days (35 mg/kg total dose). Following perfusion-fixation of the brain, ultrathin sections of the prostrema were prepared and studied. Pleomorphic vacuolated dense bodies in the perikaryon of the oligodendrocytes were observed. The findings were suggestive of an increase in the number of oligodendrocytes in response to thallium intoxication and the formation of giant cell aggregates. These changes may represent a mechanism to deal with the metabolic disturbances caused by thallium intoxication.

**77-2759.** Neudecker, T. ; Stefani, A.; Henschler, D. (Inst. Toxicol., Versbacher Landstrasse, Wurzburg, Germany) **In vitro mutagenicity of the soil nematicide 1,3-dichloropropene.** *Experientia* 33(8): 1084-1085; 1977. (13 references)

The *cis*- and *trans*-isomers of 1,3-dichloropropene (1,3-DCP) were tested for mutagenicity using the Ames mutagenicity assay system with *Salmonella typhimurium* tester strain TA 1535. All assays gave essentially similar results. Both isomers of 1,3-DCP were mutagenic, the *cis*-isomer being about 2-fold more active than the *trans*-isomer. At all concentrations tested, survival rates of bacteria exposed to *cis*-DCP were lower than those of cells exposed to *trans*-DCP. Concentrations greater than or equal to 2 μm/ml caused a drop in the survival rate to less than 1% in the case of both isomers. There was a marked reduction in the rate of back mutations after the addition of microsomes, and the cytotoxicity of both isomers was drastically reduced. Both isomers of DCP reacted rapidly with 4-nitrobenzopyridine, suggesting a direct alkylating reactivity. The data strongly indicate that 1,3-DCP is a potential carcinogen and that it is a potent mutagen under the experimental conditions used.

**77-2760.** Bertram, U. ; Kasten, A.; Lullmann, H.; Ziegler, A. (Dept. Pharmacol., Univ. Kiel, D-2300 Kiel, Germany) **Improved treatment of organophosphate intoxication by use of scopolamine or dexetimide.** *Experientia* 33(9): 1196-1197; 1977. (9 references)

Treatment methods for organophosphate poisoning by using scopolamine or dexetimide were assessed. In one series of experiments, the protective potency of dexetimide and of dexetimide plus reactivator was compared with that of atropine and scopolamine. DPF was injected sc into mice (NMRI, 17-23 g b.wt) in a dose range of 24-4400 μmol/kg after prophylaxis and without prophylaxis. Prophylactic application of dexetimide or scopolamine plus obidoxime increased the $LD_{50}$ by a factor of up to 180. In another series of experiments, the therapeutic potency of dexetimide plus obidoxime was investigated with rabbits poisoned with paraoxone, DFP, or OMPA. The dose range of dexetimide was 0.8 to 16 mg/kg and the dose range of obidoxime was from 3.6-7.2 mg/kg. Rabbits treated with the 50- to 80-fold $LD_{50}$ doses of the organophosphates survived with treatment. These studies suggest the use of scopolamine or dexetimide for treatment of organophosphate intoxication.

**77-2761.** Vorob'eva, N. M. ; Lapchenko, V. S. (Lab. Toxicol., Res. Inst. Food Hyg., Kiev, USSR) **Funktsional'nye izmeneniia pecheni pri vozdeistvii na organizm fosfororganicheskikh pestitsidov. [Functional changes in the liver under the influence of organophosphorus pesticides.]** *Gig. Sanit.* (3): 108-110; 1976. (2 references) (Russian)

The effects of anthio (formothion, 16.3 mg/kg/day), ciodrin (2.02 mg/kg/day) and amiphos (25 mg/kg/day) on the hepatic function of dogs were studied by the investigation of certain biochemical parameters after oral administration for 1 mo. Increased serum protein level was found only in the group treated with amiphos (6.12 mg% vs 5.8 mg% in the control). The serum albumin level was decreased in all three groups (39.1-47.7 mg% vs 54.8 mg% in the control), while the globulin level was increased in all groups (52.0-61.2 mg% vs 44.9 mg% in the control). The glutamic-aspartic transaminase activity of the liver was significantly reduced in the groups treated with amiphos (7.7 μmol/mg/min) and ciodrin (6.6 μmol/mg/min) compared with the control (8.9 μmol/mg/min), while the glutamic-alanine transaminase activity was significantly increased in all groups (11.3-17.8 μ mol/mg/min vs 9.5 in the control). The glycogen level was significantly increased (11.2-14.4 mg% vs 5.54 mg% in the control). The cholinesterase activity was 6.9-13.9 μg/ml/min in the erythrocytes of the experimental groups vs 27.9 μ g/ml/min in the controls, and 28.5-35 μg/ml/min in the liver of the experimental animals vs 390.6 μg/ml/min in the controls. Pathological lactose test results were observed in dogs treated with ciodrin. The findings indicate that prolonged treatment of dogs with anthio, ciodrin and amiphos causes considerable functional changes of the liver.

**77-2762.** Vorotyntsev, A. A. ; Luzhnikov, E. L.; Barsukov, Yu. F.; Iaroslavskii, A. A.; Kotov, N. N.; Skachkov, V. B. (Centr. Inst. Adv. Training for Physicians, Moscow, USSR) **Sravnitel'naia kharakteristika metodov uskorennogo vyvedeniya khlorofosa v eksperimente. [Comparative assessment of methods for the rapid elimination of trichlorfon in experiments.]** *Gig. Sanit.* 8: 76-78; 1977. (Russian)

The effectiveness of different methods for the rapid elimination of trichlorfon from the body was studied in dogs and rabbits poisoned orally with LD100 doses of $^{32}P$-labeled trichlorfon (300 mg/kg for dogs and 700 mg/kg for rabbits). The mean trichlorfon clearance achieved by peritoneal dialysis was 4 ± 0.3 ml/min in rabbits and 8.9 ± 0.5 ml/min in dogs, corresponding to 10-15% reduction of the trichlorfon level of the blood after 4-5 dialyses. The mean clearance achieved with hemodialysis was 42 ± 2.5 ml/min, corresponding to a 20-25% reduction of the trichlorfon level in the blood. Blood perfusion with adsorption on activated carbon SKT-6 proved to be most efficient; the mean clearance was 92.4 ± 3.2 ml/min, corresponding to a reduction of the trichlorfon level in the blood by 30-40% in 1 hr. It caused marked improvement of the condition of the animals in 20-30 min.

**77-2763.** Pivovarov, Yu. P. ; Ivashina, S. A.; Padalkin, V. P. (N. I. Pirogov Second Moscow Med. Inst., Moscow, USSR) **Gigienicheskaya otsenka izucheniya insektitsidnykh preparatov. [Hygienic assessment of investigation of insecticide preparations.]** *Gig. Sanit.* 8: 95-98; 1977. (Russian)

Toxic effects of an entomopathogenic insecticide preparation based on *Bacillus thuringiensis* var. *galleriae* were studied in animals and volunteers. Following oral administration of crystal-forming bacteria, the animals showed destructive-dystrophic and reactive processes. Loss of appetite, hyperthermia, and altered hematological parameters and serum complement activity were observed after oral, intravenous, intranasal, and intradermal application. Entomopathogenic bacteria were found in the blood. The ingestion of foods artificially infested with such bacteria in concentrations of $10^5$-$10^9$ cells/g caused nausea, emesis, diarrhea, tenesmus, colic-like pains in the abdomen, and hyperthermia. The incubation period was 8 hr. The findings indicate that entomopathogenic bacteria used as pesticides can cause diseases which are clinically similar to food poisoning produced by other representatives of the *B. cereus* group.

**77-2764.** Kashyap, S. K. ; Gupta, S. K. (Natl. Inst. Occup. Health, Ahmedabad, India) **Effect of ultra low-volume aerial spray of phosphomidon (organophosphorous insecticide) on human volunteers: a field surveillance study.** *Ind. J. Med. Res.* 64(4): 579-583; 1976. (3 references)

A field study on the toxicological hazards to humans of ultra-low volume (ULV) aerial spray of phosphomidon is presented. One hundred fifty hectares of paddy crops in the Trichy district of Tamil Nadu, India were sprayed with phosphomidon at 550 g/hectare. Thirty-two volunteer subjects between the ages of 10 and 70 were stationed within the spraying area during spraying and for 1 hr afterwards. The subjects underwent medical examinations, including cholinesterase determinations, 3x before exposure, and also 3 hr and 1, 3, 6, and 9 days after exposure. Pre- and post-exposure values of RBC, WBC, and PCV did not show significant differences. Maximum percentages of plasma cholinesterase inhibition, which occurred 1-3 days post spray were 0-25% in

11 subjects, 26-50% in 19 subjects, and over 50% in 2 subjects. These data point to the need for continued monitoring of UVL spray operations involving hazardous pesticides.

**77-2765.** Bhan, A. K. ; Kaul, B. L. (Regional Res. Lab., Jammu, Tawi 180001, India) **Cytogenetic activity of dichlorvos in barley.** *Indian J. Exp. Biol.* 13(4): 403-405; 1975. (12 references)

Results are reported on the lethal, cytological and mutagenic effects of dichlorvos on the seeds of barley. Dichlorvos was used at 0.25, 0.50, and 0.75 mM concentrations. Seeds were treated for 6 and 18 hr with controls placed simultaneously in distilled water. All doses of both 6 and 18 hr durations reduced seed germination, seedling height, and seed fertility. In general, 18 hr treatment produced slightly more damage, but the effects were not dose dependent. The number of dividing cells as measured by mitotic index was appreciably reduced by dichlorvos. Chromosomal aberrations were induced by all the treatments. Meiosis was usually normal, but occasionally aberrations as polypoid cells and tetravalent chromosome formations were noted. While these studies confirmed lethal and cytological activity, the mutagenic activity could not be confirmed.

**77-2766.** Duel, W. ; Zelman, S. (AMA Dept. Environ. Public Occup. Health, Chicago, IL) **Can agricultural chemical runoff harm farm-pond fish?** *J. Am. Med. Assoc.* 238(15): 1669; 1977.

Problems associated with the biocentration of pesticide residues in the flesh of fish inhabitating farm ponds which may eventually be consumed by humans is discussed. The author has found no epidemiologic or laboratory-supported evidence of measurable human illness resulting from ingestion of farm-pond fish. Standards have been set for acceptable levels of aldrin, dieldrin, and polychlorinated biphenyls in the flesh of fish intended for human consumption, and additional standards based on reasonable risks rather than demonstrated human illness are presently under consideration. (Author abstract by permission.)

**77-2767.** Siers, D. G. ; Mersmann, H. J.; Brown, L. J.; Stanton, H. C. (Shell,Development Co., Modesto, CA 95352) **Late gestation feeding of dichlorvos: A physiological characterization of the neonate and a growth-survival response.** *J. Anim. Sci.* 42(2): 381-392; 1976. (43 references)

This study was undertaken to investigate the physiologic basis for the response of newborns from dichlorvos treated dams. This antihelminthic treatment has been reported by some researchers to result in heavier weaning weight of the dams and increased vigor and decreased mortality of piglets. Experimental sows used in this study were treated with 1,000 mg dichlorvos in their daily feed allowance from gestation day 80 until farrowing. At farrowing, individual pig weights, viability score for each pig, number of live and dead pigs per litter, time interval between pigs, umbilical blood glucose, and umbilical blood lactate were recorded. At 7, 14, 21, 60, 120, and 160 days after birth, the dichlorvos treatment resulted in litters that were heavier. Lipid content of colostrum from treated sows was higher than controls. Temperature stress measurements were also made on the neonates, and significant effects of dichlorvos treatment were noted on the temperature response of almost every physiologic parameter tested included CPK and beta globulin levels.

**77-2768.** Freudenthal, R. I. ; Kerchner, G.; Persing, R.; Baron, R. L. (Lab., Battelle Columbus Lab., Columbus, OH 43210) **Dietary subacute toxicity of ethylene thiourea in the laboratory rat.** *J. Environ. Pathol. Toxicol.* 1(1): 147-161; 1977. (20 references)

In this ethylene thiourea (ETU) toxicity study thyroid hormone level measurements were made on Sprague-Dawley rats to determine the dietary dose level of ETU that causes thyroid hormone alterations and a dose level which does not induce thyroid changes leading to hyperplasia. Groups of rats were administered ETU in the feed at concentrations of 0, 1, 5, 25, 125, or 625 ppm for up to 90 days. Other groups of rats received amitrole (50 ppm) or propylthiouracil (125 ppm) as positive controls. Ingestion of 625 ppm ETU resulted in substantial decreases in serum triiodothyronine (T-3) and thyroxine (T-4). Marked increases in TSH were observed at 625 and 125 ppm ETU. Normal thyroid hormone levels and thyroid morphology were observed in rats fed ETU at 25 ppm. This was determined to be the dietary no-effect level for ETU in this study.

**77-2769.** Rand, G. ; Kleerekoper, H. (Dept. Biol., Texas A & M Univ., College Station, TX 77843) **Interaction of odour and flow perception and the effects of parathion in the locomotor orientation of the goldfish *Carassius auratus* L.** *J. Fish Biol.* 7(4): 497-504; 1975. (21 references)

A study was made to ascertain the locomotor orientation of goldfish *Carassius auratus* L., before and after short term treatment (24 hr) with a subacute concentration of parathion, to a source of food odor, a differential rate of water flow, and a combination of these conditions in a multiple choice situation. Goldfish were individually exposed to parathion at 1.33, 0.65, and 0.33 ppm for 96 hr. Prior to exposure, food odor alone was significantly attractive, but the combination of food odor with increased water flow was avoided. Factorial analysis demonstrated interaction between odor and increased flow. After exposure the food odor ceased to be attractive and was significantly avoided. This avoidance was not present in the food odor-increased flow combination. The parathion exposure did not affect the response to the flow conditions per se but reversed the interaction between food odor and increased flow. In addition, the exposure to the pesticide itself interacted with food odor-flow response. The short term exposure to the subacute organophosphate concentration affected not only the perception of food odor and flow individually, but also the interaction between these common environmental stimuli.

**77-2770.** Reuber, M. D. ; Ulland, B. M. (Columbia, MD) **Acute and chronic renal and hepatic disease in rats fed Mirex.** *J. Natl. Cancer Inst.* 59(4): 1051-1053; 1977. (11 references)

In a recent study in Charles River CD rats, some male and female animals fed 100 ppm Mirex and some males fed 50 ppm Mirex developed hepatocellular carcinomas. The incidence was higher in animals given the higher dose, and males were more susceptible than females. There was a high incidence of hyperplastic nodules or early hyperplasia of the liver among the animals which did not develop carcinomas, and some developed other hepatic lesions, i.e. hemangiomas and lymphangiomas. Chronic nephritis, renal necrosis, parathyroid hyperplasia, chronic myocarditis, and calcium deposits in the lungs, aorta, and other organs also occurred at a higher rate among Mirex treated than control rats. Since a decreased lifespan and poor health interfere with the development of tumors, toxic effects other than carcinogenicity must be evaluated in long-term animals studies. Although the investigators who conducted this study agree that the liver lesions observed in the Mirex-treated rats were characteristic of an early response to a carcinogenic agent, they feel that the nephropathy and cardiomyopathy observed in the treated animals were due to aging and not to the pesticide treatment.

**77-2771.** O'Donoghue, J. L. ; Nasr, A. N. M.; Raleigh, R. L. (Toxicol. Sec., Health, Safety, & Human Factors Lab., Eastman Kodak Co., Rochester, NY 14650) **Toxic neuropathy--An overview.** *J. Occup. Med.* 19(6): 379-382; 1977. (21 references)

Factors involved in the assessment of neurotoxic potential are discussed. Identification of neurotoxic substances requires well controlled epidemiologic studies of humans, including electrodiagnostic testing, and experimental animal studies. Experimental design parameters considered include choice of animal species, protocol for administration of substance to be tested, clinical evaluation, electrophysiological testing, morphologic assessment of induced changes, and recognition potential for the concomitant natural neurologic pathologies. A class of compounds which have been extensively studied with regard to neurotoxicity are the aryl phosphates as represented by the pesticide tri-*ortho*-cresyl phosphate (TOCP).

**77-2772.** Arly Nelson, F. ; Struck, R. F.; James, R. (Kettering-Meyer Lab., S. Res. Inst., Birmingham, AL) **Role of metabolism in the estrogenic activities of methoxychlor and *o,p'*-DDT.** *J. Toxicol. Environ. Health* 3(1-2): 366-367; 1977.

Previous studies had failed to demonstrate whether *o,p'*-DDT and methoxychlor exert estrogenic activity in intact form or as metabolites. Preincubation with liver microsomes in the presence of NADPH enhances the inhibition of $^3$H-estradiol binding to its rat uterine receptor in vitro. However, preincubation treatment does not alter the inhibition produced by *o,p'*-DDT. The uterotropic response to *o,p'*-DDT is increased by pretreatment of immature rats with $CCl_4$ or SKF-525A but is reduced by pretreatment with phenobarbital. Pretreatment with carbon tetrachloride in vivo enhances the response to methoxychlor, whereas the uterotropic response to methoxychlor is not affected by pretreatment with SKF 525-A or phenobarbital. At 10 ppm, *p,p'*-DDT did not display estrogenic nor antiestrogenic activity according to an in vitro estrogen assay that measured induced protein synthesis; however, *o,p'*-DDT at 50 ppm inhibits $^3$H-estradiol binding to nuclei of incubated whole uteri. These results suggest that methoxychlor develops its activity by metabolism, while *o,p'*-DDT may be active as such.

**77-2773.** Geptner, V. A. (Agrobiol. Stn. MGU, USSR) **Vliianie diurona na mikrofloru pochvy i ila. [The effect of diuron on the microflora of soil and muck.]** *Khim. Sel. Khoz.* 15(3): 71-75; 1977. (10 references) (Russian)

The effect of diuron on the microflora of soil and muck was studied to determine the biochemical processes involved. Muck samples were taken from the place where the chemical was applied, 750 m away, and from a control area 1, 3, 10, 30, 90, and 120 days after 60 kg of herbicide were applied per 1 ha of water surface. Soil samples were collected at the same time from cotton fields that were cultivated with diuron (1.5 kg/ha) and from control field. It was found that the effect of diuron on different microorganisms depends not only on its preparation from but on the medium (soil, water, muck) as well. The growth of heterotrophic bacteria in muck or soil was retarded, and the growth of spore and ammonium bacteria was stimulated during the first 10 days following the use of diuron. In vitro experiments show that there is no appreciable effect of diuron on microorganisms when used at the recommended dosage.

**77-2774.** Korotkova, O. A. ; Promonenkov, V. K. (Vniikhszr, USSR) **Pestitsidy i okruzhaiushchaia sreda: piretriny i piretroidy [The environment and the pyrethrin and pyrethoid pesticides.]** *Khim. Sel. Khoz.* 15(6): 39-52; 1977. (33 references) (Russian)

The question of the environmental effects of pyrethrin and pyrethroid pesticides is discussed by way of reviewing the existing literature on the subject. The following aspects are dealt with: (1) photochemical degradation of pyrethroidal acid and resmethrin; (2) the most potent pyrethroids; (3) metabolism of phenothrin in mammals; (4) pyrethrum toxicity for aquatic organisms; (5) kinetic parameters for insect esterases, and (6) MTD of pyrethrin residue in vegetable and animal products.

**77-2775.** Vas'kovskaya, L. F. (Inst. Zool., Acad. Sci., Kiev, USSR) **Organizmy - indikatory zagriazneniia okruzhaiushchei sredy pestitsidamy. [Animals as indicators of environmental contaminations by pesticides.]** *Khim. Sel. Khoz.* 15(16): 52-55; 1977. (4 references) (Russian)

A 3 yr study was conducted to evaluate the environmental contamination by organochlorine pesticides. The residues were measured chromotographically on 11 organs and systems of 45 animal species. The level of DDT, hexa-

chlorocyclohexane, DDE and DDD in the environment was determined through 4000 analyses. There was no correlation between the level of pesticide administered to mouse-like rodents and its content in the body. The average level of DDT in the organs of 5 kinds of rodents is given. It was found that the cumulative capacity of organs depends on the structure and content of the organ lipids, sex, time of year, species of animal, and level of pollution in the environment. Pesticide accumulation at all trophic levels is connected with similar processes at other levels. The amount of pesticides is 8-10 times higher on the animal trophic level than in plants and 30-50 times more than in water and soil respectively. Predators were found to have the highest level of pesticide residue. Mouse-like rodents are recommended as indicators of environmental pollution.

**77-2776.** Subba Rao, N. B. (Osmania University, Hyderabad, India) **Poisk biologichesi aktivnykh veshchestv v riadu geteroaromaticheskikh soedinenii (Obzor) [Study on biologically active substances comprised of various heteroaromatic compounds. A review.]** *Khim. Geterotsikl, Soed.* 3: 291-310; 1977. (126 references) (Russian)

A review is presented of biologically active substances of the following groups: (1) oxygen-containing heterocyclics (benzo-α-pyrone, γ-pyrone derivatives, synthesis of some natural substances, xanthone, coumarone, and photochemical transformation of heterocyclic systems); (2) nitrogen heterocyclics (formation of nitrogen heterocyclics from *o*-diamine and carbony compounds and their thermal stability, the interaction of *o*-chloronitrobenzene and benzylamine, nitrogen-containing heterocyclics); (3) heterocyclics with 2 different hetero atoms (synthesis of oxazoles, isoxazoles and their condensed derivatives, reactivity of derived isoxazoles, spectral studies), and (4) the chemistry of some heterocyclics with more than 2 hetero atoms.

**77-2777.** Gak, J. C. ; Graillot, C.; Trauhaut, R. (Centre Rech. Toxicol., Fac. Sci. Pharm. Biol., Univ. Rene Descartes, Paris, France) **Use of the golden hamster in toxicology.** *Lab. Anim. Sci.* 26(2): 274-280; 1974. (37 references)

The use of the golden hamster in toxicological studies is discussed. Studies are cited which show the development of the use of this particular animal in science. Biochemical, anatomical, and other characteristics of the hamster are reviewed which make it a valuable, although somewhat limited, tool for toxicological research. A comparison was made of the effects of organochloride insecticides on rats, mice, and hamsters. Substances can thus be classified into 3 groups, based on the hamster's sensitivity to acute toxic effects. The hamster is so insensitive to DDT and its metabolites DDD and DDE that a median lethal dose cannot be established. However, its sensitivity to other organochlorines varies when compared with mouse and rat sensitivity. Long term effects of sub-lethal doses of organochlorine insecticides on biochemical pathways were evaluated, particularly on liver function. Details on the induction of drug-metabolizing enzymes in the hamster and in the rat were also explored.

**77-2778.** Sudershan, P. ; Cutkomp, L. K. (Dept. Entomol., Fisheries and Wildlife, Univ. Minnesota, St. Paul, MN) **The sensitivity of ATPases from mouse tissues to DDT at different temperatures.** *Life Sci.* 21(7):921-926; 1977. (38 references)

Oligmoycin-sensitive (O-S) $Mg^{2}+$ ATPase from mouse brain has a higher sensitivity to DDT at a low temperature, 17°C than at 27° or 37°. The $I_{50}$ value for 17° was 0.24 μM DDT. The DDt sensitivity did not differ significantly at 27° and 37°C. This negative temperature correlation is similar to results in brain and muscle tissues of insects. Oligomycin-insensitive $Mg^{2}+$ ATPase, also was inhibited by DDT more effectively at cooler temperatures. In contrast, O-S $Mg^{2}+$ ATPase from mouse muscle showed no significant sensitivity difference to DDT at the 3 temperatures. Na+-K+ ATPase, inhibited to a lesser degree by DDT, was inhibited to a much greater extent (61%) at 37° than at 17° (23%). This positive temperature correlation is similar to findings in insect homogenates.

**77-2779.** Fechner, G. ; Topfer, H.; Zorn, E. (Bezirksinstitut fur Veterinaerwesen 1503 Potsdam-Bornstedt, DDR;) **Rueckstandsanalytische Untersuchungen nach perkutaner Applikation der Karbaryl-Formulierung VIOXANR beim Schwein. [Analysis of residues after percutaneous application of VIOXANR to pigs.]** *Monatsh. Veterinaermed.* 29(10): 374-376; 1974. (12 references) (German)

The residue dynamics of Vioxan (carbaryl, 0.5% suspension) was studied by a thin-layer chromatographic enzymatic method in tissues from pigs at different dates after they were sprayed with a dose of 1 mg/kg. Residues above 0.02 ppm (the legally permissible limit in East Germany) but under 1 ppm were found in fatback and some muscle (cutlets and butts) up to 5 days after the treatment, while in other organs and tissues the residue levels were below 0.02 ppm. Fourteen days after the treatment the residue levels slightly exceeded the permissible limit in cutlets only. The findings indicate that pigs treated percutaneously with vioxan for ectopassite control should not be slaughtered for human consumption within the first 14 days after treatment.

**77-2780.** Bignami, M. ; Aulicino, F.; Velcich. A.; Carere, A.; Morpurgo, G. (Ist. Superiore di Sanita, Rome, Italy) **Mutagenic and recombinogenic action of pesticides in *Aspergillus nidulans*.** *Mutat. Res.* 46(6): 395-402; 1977. (27 references)

Thirteen pesticides, aminotriazole, benomyl, captafol, captan, dalapon-Na, dichlorvos, dinobuton, dodine, ioxynil, mecoprop, neburon, picloram and tordon were tested for ability to induce (1) point mutations to 8-azaguanine resistance, (2) mitotic crossing-over, and (3) mitotic non-disjunction and haploidization in *Asperigillus nidulans*. Tests were performed at three different pHs, i.e. 4.5, 7, 8.2. Three of the pesticides, captan, captafol and dichlorvos induced point mutations; dichlorvos also induced a high frequency of mitotic crossing-over and non-disjunction; benomyl induced a very high frequency of non-disjunction whereas amino-

triazole induced weekly both types of somatic segregation. (Author abstract by permission)

**77-2781.** Becroft, D. M. O. ; Bakes, M. N. (Auckland, New Zealand, Div. Pub. Health, Dep. Health, Wellington, New Zealand) **The safety of the herbicide 2,4,5-T.** *N. Z. Med. J.* 86(591): 35-36; 1977. (6 references)

In a recent article, it was stated that, if humans had the same sensitivity as animals, the LD50 of dioxin would be about 40 μg and as little as 8 μg might be teratogenic. However, a letter-to-the-editor states that it would be necessary to ingest approximately 44 gal of 2,4,5-T spray to obtain 40 μg of dioxin and approximately 2 gal of 2,4,5-T spray to obtain 8 μg of dioxin. It is highly unlikely, therefore, that toxic or teratogenic amounts of dioxin could be accidentally ingested following routine spray application of 2,4,5-T. Furthermore, only minor fetal malformations were induced at low frequency in the more susceptible animal species following administration of sublethal doses. A large amount of responsible and independent scientific study of dioxin and 2,4,-5-T over the past 25 yr has demonstrated that the use of 2,4,5-T spray presents no environmental hazard. Another letter-to-the-editor commenting on the same article states that the authors confused the toxicity of dioxin with its hazard. Although dioxin is one of the most toxic chemicals known, it constitutes less than 0.1 ppm of 2,4,5-T. Since dioxin is also from 5000 to 500,000 times more toxic than 2,4,5-T, it would be necessary to consume 250-1000 liters of 2,4,5-T spray to ingest a lethal dose (40 μg) of dioxin. The only teratogenic effect which can be reliably attributed to dioxin is cleft palate in the mouse, and, in general, dioxin is more likely to kill the embryo than to induce malformations. In all species tested except the mouse, doses of dioxin below the maternally toxic dose had little or no effect on the developing embryo. Thus, dioxin must be considered a qualitatively rather weak teratogen. Based on the susceptibility of the mouse, the amount of dioxin which a woman might absorb under the most extreme accidental ciccumstances would be at the least hundreds of times less than the amount which might cause teratogenic effects. Furthermore, if dioxin were exerting teratogenic effects, it would be expected that at least some exposed mothers would show chloracne, the initial sign of dioxin poisoning in humans. Chloracne has never been known to result from the use of 2,4,5-T in New Zealand. None of the numerous attempts to establish a link between the spraying of 2,4,5-T and human congenital abnormalities have ever proved successful.

**77-2782.** Walsh, F. ; Mitchell, R. (Lab. Applied Microbiol., Havard Univ., Cambridge, MA) **Inhibition of intermicrobial predation by chlorinated hydrocarbons.** *Nature* 249: 673-674; 1977.

The inhibition of chemotoxis by pollutants (e.g., chlorinated hydrocarbons) may directly affect enteric bacteria predation and therefore estuarine self-purification rates. The rate of kill of *Escherichia coli* by marine predators in the presence of 2,4-dichlorophenoxyacetate (DPA) and *o,o*-dichlorobiphenyl (DB), was examined. Predators were isolated from sea water by repeated subculture in artificial seawater using *E. coli* as the sole carbon source. The predator culture consisted of at least two distinct species of *Spirillum*. The mechanism of lysis of *E. coli* by the dominant *Spirillum* did not appear to be direct contact but appears to be based on maintainence of a critical concentration of lytic enzymes. Both fully mixed and standing predator populations in concentrations of 10, $10^3$, $10^5$, and $10^7$ per ml were tested for percent of *E. coli* in the presence of $10^4$ and $10^3$ *M* DPA and $10^5$ and $10^3$ *M* DB. The lower chlorinated hydrocarbon (concentration previously reported to inhibit chemotaxis decreased the percentage kill of *E. coli* in standing culture. The higher concentrations of chlorinated hydrocarbons (concentrations previously reported by the authors to stimulate chemotaxis) increased the kill rates in standing culture. These results suggest that observed changes in *E. coli* kill rates result from inhibition or stimulation of the chemotactic response in marine predators of *E. coli*. (Author abstract by permission)

**77-2783.** Cabral, J. R. P. ; Shubik, P.; Mollner, T.; Raitano, F. (Eppley Inst. Res. Cancer, Univ. Nebraska Med. Ctr., Omaha, NB 68105) **Carcinogenic activity of hexachlorobenzene in hamsters.** *Nature* 268(5628): 510-511; 1977. (8 references)

Six-week-old Syrian hamsters were maintained for life on a diet containing 50, 100, or 200 ppm HCB. At 50 wk, the survival rate among HCB-treated and untreated control animals was 71%, but at 70 wk, survival was reduced in the 200 ppm HCB group. Compared with controls, males treated at 200 ppm HCB showed a marked reduction in weight. The incidence of tumors, the average number of tumors per hamster, and the number of animals with more than one tumor were increased in the HCB-treated animals; the increases were dose dependent. Thyroid tumors, hepatomas, and hemangioendotheliomas were found only in the HCB-treated hamsters, the incidence of all three tumors being significantly higher in males given 200 ppm HCB than in controls. The incidence of adrenal neoplasms was also greater in the HCB treated hamsters, but the increase was not significant. The data suggest that HCB may behave like certain known carcinogens with multipotential activity. Epidemiological information regarding the effects of HCB is needed before the relevance of experimental studies can be extrapolated to humans.

**77-2784.** Hoshijima, K. ; Narita, S.; Motojuku, H. (Sch. Hyg. Fukushima Prefectural Med. Coll., Fukushima, Japan) **[Effects of low toxicity organophosphate insecticides on spontaneous and forced movements of mice. Part 2.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(3): 324-334; 1977. (1 reference) (Japanese)

Cyanophos (8.6 mg/kg/day), salithion (13.0, 2.6 and 1.3 mg/kg/day) and diazinon (140, 2.8 and 1.4 mg/kg/day) were respectively mixed with daily diet, and each was fed to 24 (cyanox only) or 36 CFW male rats for 24 and 36 days. Then the rats were examined for motility (spontaneous move-

ment) and forced movement (treadmill) at the age of 50-54 days. The average body weight of the animals was 37 g. The results of tests between 24 day feeding and 36 day feeding showed no difference. No significant difference in motility test results was found between treated animals and controls. In all the treated animals the results of the treadmill test were poorer than in controls. Their cholinesterase activity and values of serum enzyme activities showed no change. These results show that the administration of cyanophos, salithion and diazinon lowered only the general physical capability for forced movement when given under the conditions above mentioned.

**77-2785.** Horiguchi, Y. ; Asanuma, N.; Abe, E.; Kurosawa, K.; Sasaki, K.; Suzuki, A. (Inst. Rural Med., Saku, Nagano, Japan) **[Effects of leptophos administered orally to mammals.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.* 26(3): 322-323; 1977. (Japanese)

Leptophos was forcibly administered p.o. in a single dose to 4 groups of rats (12 animals per group) at dose rates of 5, 10, 15, and 20 mg/kg, respectively, and 3 animals each from every group were killed on the 5th, 10th, 20th, and 40th day to determine the residual amount of leptophos in their fat as well as the histopathological status, as compared to those rats given fenitrothion at the dose rate of 100 and 300 mg/kg. Two animals of the 20 mg/kg group died within 24 hr. The residual amount of leptophos was relatively larger on the 5th day and was still detected on the 20th day; however, it was not detected on the 40th day. No neurotoxic symptoms were observed during 40 days of observation. Some pathological findings were obtained in the liver on the 5th day; however, regeneration of hepatic cells became active enough after the 10th day, leaving no stromal lesion. In another experiment, 5 mg/kg or 10 mg/kg of leptophos were administered p.o. to one monkey each, every 10 days, for a total of 10 or 8 times. The EEGs of the monkeys given 5 mg/kg doses of leptophos 10 times did not show any marked change. EEGs of the animals given 10 mg/kg showed slow waves 5 days after the first administration and showed intermittent irregular spikes and waves 2 days after the seventh administration. However, no neurotoxic symptoms appeared in the two monkeys.

**77-2786.** Kineguchi, H. ; Konno, N. (Sch. Pub. Health, Fukushima Prefectural Med. Coll., Fukushima, Japan) **[Neurotoxicity of leptophos administered to intervals in a divided threshold dose.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.* 26(3): 320-321; 1977. (Japanese)

After finding that the threshold amount of leptophos causing delayed neurotoxicity to White Leghorn hens was 250 mg/kg, two series of experiments were carried out. The first series consisted of giving 250 mg/kg once, 125 mg/kg/day for 2 consecutive days, 83 mg/kg/day for 3 consecutive days, and 50 mg/kg/day for 5 consecutive days, respectively to 4 groups of hens, the groups consisting of 5 hens each. The number of hens which showed ataxia was 0, 1, 4 and 5, respectively, in the above order, and the number of surviving hens after 45 days was respectively 4, 5, 2, and 2 in the above order. In the second experiment, hens were divided into 5 groups (consisting of 5 individuals), and 50 mg/kg/day of leptophos was administered every day, every other day, every two days, every three days, or every four days to each group, with the total times of administration being 5. The number of hens which showed ataxia was 5, 5, 5, 4, and 4 in the above order. Administration of the total amount of leptophos in divided protions caused the stronger toxicity. However, when the interval of administration was larger than 3 days, the toxicity was lessened, suggesting a relationship between the biological half life of leptophos and the occurrence of neurotoxicity.

**77-2787.** Smith, J. W., Jr. ; Jackson, P. W. (Dep. Entomol., Texas A&M Univ., College Station, TX 77843) **Effects of insecticidal placement on non-target arthropods in the peanut ecosystem.** *Peanut Sci.* 2(2): 87-90; 1975. (12 references)

Three methods of applying insecticides, including parathion, carbaryl, Dyfonate (fonofos) and Dasanit (fensulfothion) to irrigated peanuts for soil insect suppression were compared in order to evaluate their impact on nontarget arthropods. One hundred 365 $cm^2$ D-vacR samples were taken per treatment for each sampling date and arthropods were later removed, categorized, and counted. Pesticides were applied as basal directed sprays, as broadcast applications, and as granular applications. All application methods showed immediate reductions in most nontarget arthropod populations; broadcast sprays had the greatest detrimental impact on nontarget arthropods and granular applications had the least.

**77-2788.** Hart, G. ; O'Brien, R. D. (Sec. Neurobiol. and Behavior, Cornell Univ. Ithaca, NY 14853) **Dissociation and phosphorylation constants for the inhibition of acetylcholinesterase by a series of novel *O*-ethyl *O*-phenyl *S*-*n*-propyl phosphorothioates.** *Pestic. Biochem. Physiol.* 6: 85-90; 1977. (23 references)

Phosphorylation, dissociation, and bimolecular reaction constants for the inhibition of acetylcholinesterase by substituted *O*-ethyl *O*-phenyl *S*-*n*-propyl phosphorothioates (EPP) in the presence of substrate was investigated using spectrophotometric methods. Data obtained are discussed in terms of electronegativity of substitutents and in vivo toxicity. The *Ki* values for substituted EPP in 1 x $10^3$/M/min were: unsubstituted - 2.50, trichlorophenyl derivative (d) - 3.89, *p*-chlorophenyl d - 10.1, *p*-methyl d - 2.10 *p*-methylbenzoate d - 7.58, *p*-nitrophenyl d - 145. $LD_{50}$ values of these inhibitiors were determined for southern army worm, house fly, susceptible red spider mite, resistant red spider mite, and mouse. Of these compounds, only *p*-nitrophenyl EPP was a strong inhibitor of acetylcholinesterase activity in vitro, approaching the potency of paraoxon which has a *ki* of 405 x $10^3$/M/min under identical conditions. This finding, together with the generally poor coorelation between inhibitory potency and toxicity, suggests that the action of these compounds may be a function of several factors other than the ability to inhibit acetylcholinesterase.

**77-2789.** Leather, G. R. ; Foy, C. L. (Dep. Plant Pathol. Physiol., Virginia Polytech. Inst., Blacksburg, VA 24061) **Metabolism of Bifenox in soil and plants.** *Pestic. Biochem. Physiol.* 7(5): 437-442; 1977. (9 references)

Mechanisms of methyl-(2,4-dichlorophenoxy)- 2-nitrobenzoate (bifenox) degradation in soil and plants were investigated. Bifenox had a half-life of 3-7 days after preemergence application to a greenhouse soil mix and was metabolized to 5-(2,4-dichlorophenoxy)- 2-nitrobenzoic acid, 2,4-dichlorophenyl 4-nitrophenyl ether, and 5-(2,4-dichlorophenoxy) anthranilic acid. Studies with shoot-tissue macerates demonstrated that biphenox was not degraded by corn or soybeans, but was degraded to less than 1% by velvetleaf (*Abutilon theophrasti Medic*). Remaining bifenox was bound in increasing amounts of soil colloids, where further metabolism continued. Further study is needed to identify other metabolites.

**77-2790.** Appleton, H. T. ; Nakatsugawa, T. (Dep. Entomology, State Univ. New York, Syracuse, NY 13210) **The toxicological significance of paraoxon deethylation.** *Pestic. Biochem. Physiol.* 7(5): 451-465; 1977. (39 references)

In vitro and in vivo dearylation and deacylation of paraoxon and parathion were examined using induction as a modulating tool. Sprague-Dawley rats and CF-1 mice were used in these experiments. Aldrin, dieldrin, and DDE were used as enzyme inducers. The relative abundance of paraoxon degradation products was not altered by pretreatment of rats with enzyme-inducing agents, although oxidative paraoxon *O*-deethylase of male rat liver was greatly increased to levels equivalent to the level of the various hepatic hydrolytic enzymes. This suggests that a large portion of hepatic hydrolases detected in vitro are not active in vivo. It also appears that the hepatic deethylase induced in vitro was not involved in vivo at the dosage levels employed. The predominant metabolite of ethyl-monoethyl paraoxon was shown to be $CO_2$, while phenyl-monoethylparaoxon yielded 4-nitrophenol. Paraoxon deethylation is an important detoxication mechanism in female rats and male mice and must be considered when interpreting the toxicologic properties of parathion and paraoxon.

**77-2791.** Couch, R. C. ; Siegel, M. R. (Dep. Plant Pathol., Univ. Kentucky, Lexington, KY 40506) **Interaction of captan and folpet with mammalian DNA and histones.** *Pestic. Biochem. Physiol.* 7(6): 531-546; 1977. (36 references)

The possibility that the trichloromethylsulfenyl fungicides (captan and folpet) exert deleterious effects on the genetic material by a direct interaction of the fungicide with two genetic material components, histones and DNA was investigated. Binding of $^{35}$S-captan or $^{14}$C-folpet to calf-thymus histones was observed to be pH dependent, as were gel electrophoresis patterns of captan-treated histones. At pH 7.5, the gel patterns of captan-treated and untreated histones were identical. At pH 9.0 the Amido Schwartz-staining bands of captan- and thiophosgene-treated histones were characterized by band diffusion, loss of staining definition, band migration, and aggregate formation. Reconstitution experiments using captan-treated calf thymus DNA yielded less stable complexes, as well as smaller nucleohistone-nucleohistone complexes. These results indicate that the fungicide molecule binds to deprotonated sites on the lysine-rich histones, causing changes in the configuration of the protein molecule and thereby altering the ability of nuclear histones to stabilize the DNA.

**77-2792.** Cocks, J. A. (Agric. Res. Council, Unit. Invert. Chem. and Physiol., Univ. Sussex, Falmer, Brighton, SUssex BN1 9QJ) **Inhibition of carbaryl metabolism by nitrogen in three species of cockroach and one species of locust.** *Pestic. Sci.* 6: 259-265; 1977. (6 references)

The *in vivo* release of $^{14}CO_2$ arising from decarbamoylation of [$^{14}$C]-carbaryl (1-naphthyl methyl-[$^{14}$C]-carbamate) injected into male and female *Periplaneta americana, Leucophaea maderae, Gromphadorhina portentosa* and *Schistocerca gregaria* was measured up to 50 nmol carbaryl/g body weight. The amount of $^{14}CO_2$ released was proportional to the dose of [$^{14}$C]-carbaryl injected and was similar for both sexes of each species. The $LD_{50}$ values for carbaryl for each species did not correlate with their ability to decarbamoylate carbaryl. The degradation of carbaryl by this pathway is not therefore for limiting factor in determining the overall toxic effect of carbaryl in the four species studied. Decarbamoylation is inhibited by nitrogen in all four species. In *P. americana* the inhibition is virtually complete, in *L. maderae, G. portentosa* and *S. gregaria* the inhibition is 84%, 74% and 51% respectively. The results suggest the involvement of two enzymes, one of which is oxygen dependent. Decarbamoylation studies in air suggest the involvement of two enzymes with differing *Km* values. The involvement of aliesterases and mixed function oxidases in the decarbamoylation pathway(s) have not been established so far with this series of experiments.

**77-2793.** Matin, M. A. ; Kar, P. P.; Hasan, M. Z.; Anand, M. (Ind. Toxicol. Res. Cent., Lucknow, U.P., India) **Comparison of the chronic effects of alpha-chlordane and *p,p'* -DDT on the level of cerebral amino acids and free ammonia in mice.** *Pharmacol. Res. Comm.* 9(7): 613-619; 1977. (24 references)

Adult male albino mice weighing 20 kg were divided into three groups to assess the long term effects of α-chlordane and *p,p'*-DDT on the level of cerebral amino acids and free ammonia in mice. The cerebral free ammonia (micromoles/g brain) was 0.20 + 0.01 in control mice. Group 1 served as controls, groups 2 and 3 received 25 mg/kg/day of chlordane or DDT orally, for 45 days. The concentration of cerebral free ammonia was not altered in the DDT or chlordane-treated animals. A significant decrease in the levels of cerebral taurine, glycine, and δ-aminobutyric acid was observed in the DDT treated mice; ataxia was also produced. These studies indicate that α-chlordane lacks the chronic effects of DDT on the central nervous system. These results do not suggest a positive relationship between the lowering of cerebral amino acids and ataxia.

**77-2794.** Hallmen, U. (Dep. Botany, Univ. Stockholm, Lilla Frescati, S-104 05 Stockholm, Sweden) **Translocation and complex formation of root-applied 2,4-D and picloram in susceptible and tolerant species.** *Physiol. Plant.* 34: 266-272; 1975. (24 references)

Translocation and complex formation of $^{14}$C-labeled 2,4-D and picloram were investigated in seedlings of sunflower (*Helianthus annus* L. var. *uniflorus*), rape (*Brassica napus* L. cv. *Nilla*), wheat (*Triticum aestivum* L. cv. Starke), and Norway Spruce (*Picea abies* (L.) H. Karst.). Seedlings were placed in flasks containing 50 ml of nutrient solution and 50 μg of 2,4-D or picloram. Absorption of the herbicides varied a great deal in the four species. The highest absorption values were obtained in picloram-treated rape and in 2,4-D treated wheat with about 60% and 40% of the applied radioactivity absorbed, respectively. In 2,4-D susceptible sunflower and rape, and picloram susceptible sunflowers and spruce the herbicides were recovered in uncomplexed form. In plants which were 2,4-D or picloram tolerant, the herbicides were recovered in complexed form. These studies indicate that complex formation can counteract herbicide toxicity.

**77-2795.** Davies, D. S. ; Hawksworth, G. M.; Bennett, P. N. (Dep. Clin. Pharmacol., R. Postgrad. Med. Sch., London, England) **Paraquat poisoning.** *Proc. Eur. Soc. Toxicol.* 18: 21-26; 1977. (13 references)

Greyhound dogs were treated orally or i.v. with 1-3 mg methyl-$^{14}$C paraquat chloride, and plasma samples obtained at various intervals after dosing were analyzed by liquid scintillation spectrometry. Plasma concentration-time curves were fitted and the renal clearance of paraquat or creatinine was calculated from the urinary excretion rate divided by the plasma concentration at the midpoint of the urine collection. In some studies, *N'*-methylnicotinamide was infused at a rate of 0.2 mg/kg. Paraquat in the plasma and urine of poisoned human patients was measured by gas chromatography and the renal clearance rates were determined as above. In the dog, peak plasma concentrations of paraquat were seen 90 min after a small oral or i.v. dose. Recovery of paraquat from the urine was almost complete 24 hr after oral dosing, 50-70% of an i.v. dose being excreted within 24 hr. The renal clearance after a large dose was 57-219 ml/min and always exceeded creatinine clearance. Infusions of *N'*-methylnicotinamide reduced the renal clearance of paraquat from 135-152 ml/min to 52-64 ml/min in two animals. In doses of 20 mg/kg i.v., paraquat produced renal damage in dogs. The plasma concentrations in one human patient who survived paraquat poisoning fell rapidly from 4.5 hr after ingestion. In a patient who did not survive, the plasma concentrations declined slowly. Renal clearance of paraquat in the nonsurviving subject was 31 ml/min 14 hr after dosing and 2 ml/min at 70 hr. In subjects who survive, renal clearance may fall to 20-30 ml/min 3-4 days after dosing. Clearances averaging 100 ml/min were obtained following hemodialysis or hemoperfusion over charcoal columns. Treatment of paraquat poisoning should involve gastric lavage and the use of cathartics, oral administration of Fuller's earth, and hemodialysis or hemoperfusion.

**77-2796.** Widdop, B. ; Braithwaite, R. A. (Poisons Unit, Guy's Hosp., London, England) **Charcoal haemoperfusion in the treatment of paraquat poisoning.** *Proc. Eur. Soc. Toxicol.* 18: 156-159; 1977.

To assess the effectiveness of charcoal hemoperfusion in the treatment of paraquat poisoning, adult male beagle dogs weighing from 10.6 to 20.6 kg and fasted for at least 12 hr were dosed with the equivalent of 10 mg paraquat/kg to which was added 250 μCi of methyl$^{14}$C-paraquat chloride. All animals not treated for poisoning died between 9 and 12 days after dosing with symptoms of renal impairment and progressive respiratory distress. The amount of paraquat recovered in the urine over 7 days ranged from 13 to 47% of the administered dose, mean 30%. Of the animals receiving hemoperfusion 9/10 animals perfused within 12 hr of dosing survived. The average clearances of paraquat in the perfused animals ranged from 39 to 68 ml/min, mean 53 ml/min. A reduction in paraquat excretion was observed in animals perfused within 3 hr of dosing, but not in those animals perfused later. Plasma paraquat concentration were significantly lower in the perfused animals 2 to 6 days after dosing. These results indicate that hemoperfusion therapy in humans for cases where moderate, though potentially lethal amounts of paraquat pesticides have been ingested.

**77-2797.** Stevenson, D. E. ; Blair, D. (Shell Res. Ltd., Tunstall Lab., Sittingbourne Res. Cent., Sittingbourne, Kent, England) **The uptake of dichlorvos during long-term inhalation studies.** *Proc. Eur. Soc. Toxicol.* 18: 215-217; 1977. (4 references)

Rats were placed with their food and water in inhalation chambers in which they were exposed for up to 2 yr to 0-5 μg/l dichlorvos. The daily intake of dichlorvos from inhalation, ingestion, and percutaneous absorption was measured. Dichlorvos uptake was determined by measuring the quantity of DMPA (a major metabolite of dichlorvos) in the urine and subtracting the contributions made by the intake of DMPA. A method was developed by which inorganic phosphate was selectively removed from the urine using calcium hydroxide. Ethylation with diazoethane was then carried out following re-acidification of the sample with a cation-exchange resin. To measure the dichlorvos intake via the inhalation route only, the animals were restrained and inhalation hoods placed over their heads. To compensate for the decreased exposure time necessitated by this approach, the concentration of dichlorvos in the test atmosphere was increased so that a 24-hr exposure to a concentration of 5 mg/m$^3$ was replaced by a 1-hr exposure to 120 mg/m$^3$. The results showed that, following an inhalation-only exposure, the dichlorvos taken in is excreted as urinary DMPA in the first 24 hr to the extent of 85% of the calculated dose in the male rat and 68% in the female. Comparison of the DMPA excretion rates from these experiments with those from the 2-yr inhalation experiments indicated that the amounts of dichlorvos taken in by noninhalation routes in the latter experiments would equal the inhalation intake.

**77-2798.** Park, J. ; Darrien, I.; Prescott, L. F. (Univ. Dep. Ther., Royal Infirm., Edinburgh, Scotland) **Pharmacokinetic**

**studies and severe intoxication with 2,4-D and mecoprop.** *Proc. Eur. Soc. Toxicol.* 18: 154-155; 1977. (4 references)

A 39-year-old male was hospitalized 3 hr following ingestion of an unknown quantity of herbicide containing 10% 2,4-D and 20% mecoprop (MCPA) as the amine salts. The patient vomited soon after ingestion and on admission was in grade III coma, hypertonic and areflexic, pyrexial, and hyperventilating. Blood analysis demonstrated hypoxia with combined metabolic acidosis and respiratory alkalosis. The patient's clinical condition did not change following gastric lavage and 48 hr of intensive supportive therapy. During 48 hr of forced alkaline diuresis, the patient gradually regained consciousness and the pyrexia and hyperventilation were rapidly resolved. He had marked myotonia and a muscle weakness which persisted for 2 mo. On admission, the plasma concentrations of 2,4-D and mecoprop were 4000 and 751 μg/ml. The plasma half-lives of both substances were reduced during the period of forced diuresis, from 220 to 4.7 hr in the case of 2,4-D and from 39 to 14 hr in the case of mecoprop. The renal clearances of 2,4-D and mecoprop increased to greater than 100-fold and 10-fold, respectively, during diuresis. About 10% of the total 2,4-D and 40% of the mecoprop were excreted in the urine as acid-labile conjugates. The urinary recovery studies were consistent with absorption of about 70 ml of herbicide.

**77-2799.** Smith, L. L. ; Rose, M. S.; Wyatt, I. (Biochem. Mech. Unit. Imp. Chem. Ind., Ltd., Cent. Toxicol. Lab. Alderley Pk., Nr. Macclesfield, Cheshire, England) **The relevance of free radical formation in the rat lung to the mechanism of paraquat toxicity.** *Proc. Eur. Soc. Toxicol.* 18: 206-208; 1977. (5 references)

Male Adlerley Park specific pathogen-free rats were given paraquat or diquat (680 μ-moles bipyridyl/kg) orally and fatty acid synthesis and the oxidation of l-$^{14}$C-glucose by the lungs was studied. In other experiments, rat lung slices were incubated with various concentrations of paraquat or diquat and in vitro fatty acid synthesis and l-$^{14}$C-glucose oxidation was measured. The l-$^{14}$C-glucose oxidation was increased 4, 24, and 30 hr after oral paraquat and was increased to a lesser extent 24 and 30 hr after oral diquat. In vitro, 1 μM paraquat stimulated l-$^{14}$C-glucose oxidation whereas diquat had no effect. Both bipyridyls stimulated l-$^{14}$C-glucose oxidation at 10 μ*M*, but the effect was greater with paraquat. The differential effects of the two bipyridyls are probably related to the higher intracellular concentrations of paraquat as compared with diquat after oral dosing or in vitro incubation. Paraquat, but not diquat, also inhibited fatty acid synthesis by lung slices at concentrations of 5 and 10 μ*M*. Following i.v. injection in vivo, paraquat, but not diquat, inhibited fatty acid synthesis by the lungs 4 and 16 hr after dosing. The mechanism of toxicity of paraquat to lung cells may involve the cycling of paraquat between the oxidized and reduced forms with subsequent production of oxygen-free radicals. It may also involve the depletion of intracellular NADPH, resulting in the serious disturbance of vital cell processes, including the defense against free radical assault.

**77-2800.** Lange, P. ; Tiefenbach, B.; Wiezorek, W. D. (Institut fur Pharmakologie und Toxikologie der Wilhelm-Pieck- Universitat Rostock, Leipzig, Germany) **Effect of dithiocarb on acute toxicity and acetylcholinesterase inhibition by different organophosphates in mice.** *Proc. Eur. Soc. Toxicol.* 18: 284-285; 1977. (1 reference)

The effect of dithiocarb on carbon tetrachloride-, methyl parathion-, trichlorfon-, and dimethoate-induced toxicity and acetylcholinesterase (AChE) inhibition was studied in mice. Dithiocarb exerted a protective action against the hepatotoxicity of carbon tetrachloride and significantly increased the LD50 of parathion-methyl when given in doses of 50-250 mg/kg s.c. 30 min before administration of the organophosphate. Dithiocarb exerted no protective action against parathion-methyl when the two compounds were given simultaneously. Pretreatment with dithiocarb also increased the mean survival time after trichlrofon administration, but had no significant effect on the lethality of or mean survival time after dimethoate. Dithiocarb in vivo decreased the degree of inhibition of brain AChE produced by parathion-methyl, trichlorfon, and dimethoate. The mode of action whereby dithiocarb decreases the acute toxicity of some organophosphates is not known.

**77-2801.** Truhaut, R. ; Claude, J. R.; Blanc, F. (Lab. Toxicol., Fac. Sci. Pharm. Biol., Paris, France) **The metabolism of Aramite, a pesticide inducing liver tumors.** *Proc. Eur. Soc. Toxicol.* 18: 326-328; 1977. (5 references)

Male Wistar rats were given a single 2-g/kg dose of Aramite in olive oil by means of a stomach tube or were maintained for 56 wk on a diet containing 400 mg/kg/day Aramite. The urine was collected and analyzed using thin and thick-layer chromatography. Unchanged Aramite was not found in the urine in either the acute or chronic experiments. The miticide was transformed into two metabolites, one of which (3') is present in Aramite as an impurity. The main metabolite (3') was identified as 1-(p-tert-butylphenoxy) -2-propanol. Aramite appears to be metabolized by hydrolysis in some organ other than the stomach. The use of Aramite as a model substance for the induction of liver tumors is being investigated.

**77-2802.** Michaelek, H. ; Stavinoha, W. B. (Dep. Pharmacol., Univ. Texas Health Sci. Ctr., San Antonio, TX) **Differential dose-dependent inhibition of acetylcholine and butyrylcholine hydrolysis in rat brain by dichlorvos: potentiation of dichlorvos effects by chlorpromazine.** *Proc. Eur. Soc. Toxicol.* 18: 258-261; 1977. (5 references)

Male Sprague-Dawley rats were injected i.p. with 5-15 mg/kg dichlrovos and were sacrificed 10 min later after symptoms of intoxication had developed. Some animals were given 15 mg/kg chlorpromazine i.p. 60 min before the dichlorvos. In other experiments, rat brain homogenates were incubated for 25 min with 0.1 x $10^{-8}$ to $10^{-7}$ M dichlorvos. Increasing concentrations of dichlorvos strongly decreased the ratio of acetylcholine (ACh)/butyrylcholine (BuCh) hydrolysis in vitro and in vivo. This ratio in the absence of

dichlorvos was about 13 in vitro and in vivo. Chlorpromazine produced a statistically significant potentiation of the inhibition of ACh and BuCh hydrolysis induced by 5 mg/kg dichlrovos. This potentiation was less pronounced than that observed with chlorpromazine and 0.5 mg/kg physostigmine (i.e., the dose of physostigmine producing the same degree of inhibition of ACh as 5 mg/kg dichlrovos). The potentiation by chlorpromazine did not appear when the drug was combined with doses of dichlorvos high enough to inhibit ACh hydrolysis by more than 65% (i.e., 8-15 mg/kg). Chlorpromazine alone did not inhibit ACh or BuCh hydrolysis in rat brain in vitro. The potentiation of dichlorvos-induced inhibition of brain cholinesterases by chlorpromazine could explain some cases of dichlorvos poisoning in persons taking phenothiazine neuroleptics.

**77-2803.** Ramade, F. (Lab. Zool. Gen., Univ. Paris-Sud (Orsay), Paris, France) **La pollution par les composes organohalogenes. [Pollution by halogenated organic compounds.]** *Recherche* 7(69): 628-657; 1976. (5 references) (French)

Recent studies on the general toxic effects and environmental impacts of persistent organohalogen compounds, such as polychlorinated biphenyls, polyvinyl chloride, freons, and organochlorine pesticides (DDT, lindane, chlordane, heptachlor, aldrin, and dieldrin) are reviewed. Organochlorine pesticides accumulate in the aquatic and terrestrial fauna, and finally in man as the last link of the trophic chains. Due to their liposolubility, they act upon the lipid-rich cell membranes, especially of nerve cells, which explains their neurotoxic effects. DDT and most chlorinated cyclodienes inhibit membranal adenosine triphosphatases, and thus reduce the permeability of the cell membrane to ions. DDT, fed in concentrations of 2-250 ppm to mice in six consecutive generations, caused a significant increase in the incidence of hepatic tumors, especially of hepatoblastoma. Organochlorine pesticides have caused major shifts in the composition of the aquatic and terrestrial fauna (rarefaction and extinction of certain species).

**77-2804.** Jones, K. G. ; Sweeney, G. D. (McMaster Univ. Med. Cen., Hamilton, Ontario, Canada) **Association between induction of aryl hydrocarbon hydroxylase and depression of uroporphyrinogen decarboxylase activity.** *Res. Com. Chem. Pathol. Pharmacol.* 17(4): 631-637; 1977. (16 references)

To assess the relationship between the induction of aryl hydrocarbon hydroxylase (AHH) and decreased uroporphyrinogen decarboxylase (UD) activity, the effect of equal doses of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) on UD activity in C57BL/6J mice genetically responsive to AHH induction, and to genetically non-responsive DBA/2J mice was examined. Both responsive and unresponsive mice were fed TCDD (25 μg/kg/wk, i.p.) for 5 wk. Urine porphyrin excretion increased in the responsive group 2 wk after the first dose and continued to rise, but was unchanged in the non-responsive group. After sacrifice UD activity was decreased by 48% in the responsive mice and normal in the non-responsive mice. This study indicates an association between sustained induction of AHH and the development of porphyria caused by chlorinated hydrocarbons. A direct relationship between AHH stimulation and decreased UD activity has not been established.

**77-2805.** Butler, G. L. (Author address not given) **Algae and pesticides.** *Residue Rev.* 66: 19-62; 1977. (207 references)

Algae constitute an important part of the ecosystem that is affected by most pesticide application though they are generally not the target organisms. Studies from 1946 to 1975 on pesticide toxicity, degradation, bioaccumulation, and bioassay with respect to algae are reviewed. Herbicides, insecticides, fungicides, and polychlorinated biphenyls are each dealt with in a separate chapter. Studies on the interaction of pesticides and algae are on the increase, but only a small fraction of the commonly used pesticides have been tested. The effects of combinations of pesticides with other pesticides, with heavy metals, and with organic compounds on algae and on the interaction of algae with other natural communities needs to be studied in the field and in the laboratory. Greater emphasis needs to be directed toward stages of the reproductive cycle since gametes may be more susceptible than purely vegetative states.

**77-2806.** Williams, P. P. (Author address not given) **Metabolism of synthetic organic pesticides by anaerobic microorganisms.** *Residue Rev.* 66: 63-136; 1977. (306 references)

Literature dealing with anaerobic microbial metabolism of synthetic organic pesticides is reviewed. The organisms are viewed in terms of ecosystems and degradation is considered in situ. Over 130 compounds are reviewed including dinitroaniline, amide, nitrile, triazole, triazine, diphenyl ether, phenol, phenoxy, halogenated aromatic and aliphatic, carbamate, aliphatic, and organophosphate pesticides. Methodologies are presented for culturing, isolating, and identifying in vitro the microbes that metabolize pesticides, for identifying the metabolic intermediates, and for comparison of the abilities of different ecosystems to metabolize pesticides. Pesticides resistant to anaerobic microbial degradation are reviewed. The biochemistry of pesticide metabolism is considered. (Author abstract by permission, abridged)

**77-2807.** Vettorazzi, F. G. (Author address not given) **State of the art of the toxicological evaluation carried out by the joint FAO/WHO expert committee on pesticide residues. III. Miscellaneous pesticides used in agriculture and public health.** *Residue Rev.* 66: 137-184; 1977. (37 references)

This review is the third in a series of general reviews which present the major categories of pesticide chemicals examined by the FAO/WHO Joint Meetings from 1963 to 1975. In this report toxicological profile summaries for ammonium and bipyridylium compounds, carbamodithiotes, chlorodinitrobenzenes and derivatives, dinitrophenols, diphenyls, isoindole derivatives, miscellaneous aliphatic and inor-

ganic compounds, miscellaneous cyclic compounds, organomercurials, organotin compounds, and pyrethroids are presented. This work should be helpful for workers in the field of pesticide toxicology who are unfamiliar with the proceedings of the Joint Meetings and who wish to find exhaustive sources of reference. (Author abstract by permission, abridged)

**77-2808.** Lambert, G. ; Brodeur, J. (Dept. Pharmacol., Fac. Med., Univ. Montreal, Canada) **Influence de certains inducteurs ou de certaines combinaisons d'inducteurs enzymatiques sur l'elimination des residus du DDT chez le rat. [Influence of pretreatments with various hepatic enzyme inducers or various combinations of inducers on the elimination of DDT residues in rats.]** *Rev. Can. Biol.* 35(1): 33-39; 1976. (19 references) (French)

The influence of pretreatments with various hepatic microsomal enzyme inducers on the elimination of DDT residues was studied in rats. The rats were previously contaminated with *p,p'*-DDT at 5 mg/kg/day during a period of 20 days. The inducers used were: phenobarbital at 50 mg/kg/day, i.p.; 3,4-benzpyrene at 20 mg/kg/day, s.c.; and norethandrolone at 20 mg/kg/day, s.c. All these were given during 14 consecutive days, with each inducer being administered singly or in combination with the other two according to a 2 x 2 x 2 factorial experiment. Residues of *p,p'*-DDT, *p,p'*-DDD, and *p,p'*-DDE were measured in the blood, brain, abdominal fat, liver and kidneys. Results show that phenobarbital markedly lowered the concentration of total residues in the fat tissue and brain and that norethandrolone brought about a reduction of the residues in the blood, brain and kidneys, but not in the fat tissue. 3,4-Benzpyrene produced an increase in the residue in the brain, liver and kidneys. Therefore phenobarbital appeared to be more efficacious than the other two inducers in facilitating the elimination of DDT residues from fat tissues. Under the experimental conditions used, the elimination of DDT residues was not further accelerated by combining the inducers.

**77-2809.** Lambert, G. ; Brodeur, J. (No author address given) **Influence de pretraitements avec certains inducteurs enzymatiques sur la toxicite aigue du DDT (1,1-bis-(*p*-chlorophenyl)- 2,2,2-trichloroethane) chez le rat. [Influence of pretreatments with various hepatic enzyme inducers on the acute toxicity of DDT (1,1-bis-(*p*-chlorophenyl)- 2,2,2-trichloroethane) in rats.]** *Rev. Can. Biol.* 34(3): 121-129; 1977. (9 references) (French)

In order to assess the effects of various hepatic enzyme inducers on the acute toxicity of DDT, adult female rats were pretreated with sodium phenobarbital (50 mg/kg/day for 5 days), 3-methylcholanthrene (20 mg/kg/day for 3 days), and norethandrolone (20 mg/kg/day for 14 days), and then were given DDT (150 mg/kg) *per os*. The cerebral concentration of DDT was significantly lowered following phenobarbital pretreatment, possibly as a result of increased metabolism of DDT to DDD in the liver. Norethandrolone significantly increased the toxicity of DDT but did not appear to alter hepatic conversion of DDT to DDD (TDE) or change the cerebral concentration of DDT. The 3-methylcholanthrene was without effect. Further studies are needed to find a mechanism for the potentiation of DDT toxicity by norethandrolone.

**77-2810.** Lorgue, G. ; Delatour, P. (Author address) **Les insecticides organochlores (1 re partie). [Organochlorine insecticides. Part 1.]** *Rev. Med. Vet.* 125(6): 923-924; 1974. (French)

The chemical and toxicological characteristics and principal uses of DDT, BHC and cyclopentadiene type organochlorine insecticides are reviewed. Organochlorine insecticides are highly liposoluble, persistent, and have neurotropic effects. The oral LD50 (in mg/kg) in rats is 113 for DDT, 125 for lindane, 67 for aldrin, 87 for dieldrin, 590 for chlordane, and 90 for heptachlor. The corresponding values in man are 400-500, 100-150, 70, 40-100, 80-90, and 40 mg/kg. The LD50 values for fish are in the range of 0.01-0.5 mg/kg.

**77-2811.** Cottereau, Ph. (Pathol. Med. Betail, Ecole Natl. Vet. Lyon, 69337 Lyon Cedex 1, France) **Responsabilite des laboratoires et des veterinaires en matiere d'accidents lors de traitements de l'hypodermose bovine par les organophosphores. Propositions de plans d'indemnisation. [Responsibility of laboratories and veterinarians in relation to accidents during the treatment of bovine hypodermosis by organophosphates. Insurance plan.]** *Revue Med. Vet.* 127(2): 237-251; 1976. (French)

Toxicological and legal aspects of accidents occurring in relation to the organophosphate pesticide treatment of cattle with hypodermosis are discussed. The preparations currently used in France contain trichlorfon, fenthion, bromophos, or chloramidate (curfomate) as active principle. The maximal doses recommended for the treatment of bovine hypodermosis are 20 mg/kg for trichlorfon, 37 mg/kg for chloramidate, and 5 mg/kg for fenithion. The early poisoning symptoms, usually occurring within 12-24 hr after treatment, include meteorism, diarrhea, sometimes salivation, lacrymation, cardiorespiratory dirorders with polypnea and tachycardia, muscular tremor, and edema of the eyelids and vuiva. The late aftereffects developing in a few days include paralysis of the hind legs, which is almost always fatal. Its incidence is normally below 1/10,000 (0.95/10,000 in France). The early poisoning symptoms, affecting about 5-10% of the animals, disappear in 24-48 hr, but s.c. administration of atropine with Contrathion (pralidoxime, 250 mg s.c.) is useful.

**77-2812.** Urbanowicz, M. ; Gawecki, J. (Dep. Technol. Hyg. Hum. Nutr., Acad. Agric., Poznan, Poland) **Wplyw wybranych pestycydow z grupy ka.[The effect of selected pesticides from the group of carbamates on digestibility of diet.]** *Roczn. Panstw. Zakl. Hig.* 25(2): 145-151; 1974. (18 references)

The effect of selected pesticides from the group of carbamates on the digestibility of diet is considered. Using

the balance method, the indices of apparent digestibility of the components of LSM animal chow were determined in 30 adult male Wistar rats. Commercial preparations of carbamate pesticides (zineb, carbaryl and mancozeb) were added to the diet in amounts corresponding to one-tenth of the median lethal dose. The addition of each pesticide caused an evident decrease in food intake, which was greatest in the case of Dithane M-45 (mancozob). A statistically highly significant influence on the digestibility of total protein was noted. The digestibility of fat was more affected by fungicidal preparations Cynkotox (zineb) and Dithane M-45, while the digestibility of protein was affected in greater degree by addition of the insecticide Karbatox (carbaryl) suspension. In this study no correlation was noted between the presence of the tested preparations in diet and the digestibility of its carbohydrate components.

**77-2813.** Fjeldstad, P. ; Wannag, A. (Inst. Occup. Health, Oslo, Norway) **Human urinary excretion of the herbicide 2-methyl – 4- chlorophenoxyacetic acid.** *Scand. J. Work Environ. Health* 3(2): 100-103; 1977. (10 references)

Four healthy males aged 32 to 36 years were given 5 mg of 2-methyl -4- chlorophenoxyacetic acid (MCPA) to determine whether urinary MCPA could be used to estimate MCPA exposure. MCPA in the urine was extracted and analyzed by high pressure liquid chromatography. Approximately 50% of the ingested dose was detected in the urine within 48 hr; 5 days after ingestion the MCPA concentration in the urine was below detectable levels, 0.02 micrograms/ml. The MCPA did not increase those serum enzymes indicative of hepatocellular damage, e.g., SGPT and alkaline phosphatase. Serum creatine kinase levels were pathological in two subjects, and serum-aspartate aminotransferase (SGOT) levels were pathological in one subject. It does not seem likely that MCPA produced a toxic effect on muscle cells, however, because the pathological levels were assumed to be due to physical training, salicylate intake, and some hemolysis in the blood samples. These studies indicate that MCPA excreted in the urine in 24 hr after exposure is a useful indicator of MCPA ingestion in humans.

**77-2814.** Kocmierska-Grodzka, D. (Dep. Pharmacol., Inst. Physiol. Biochem., Med. Sch., Bialystok, Poland) **Comparative studies on the influence of some radioprotectors on the postirradiation hydrolytic function of subcellular fractions of pancreas.** *Strahlentherapie* 153(12): 837-842; 1977. (24 references)

The effects of trichlorfon and cysteamine on the hydroproteolytic activity of pancreatic subcellular fractions of control and irradiated rats were investigaed. Male and female Wistar rats weighing between 170 and 220 g were irradiated with a single dose of 800 R x-rays; biochemical analysis of lipase, $\beta$-glucuronidase, acid phoshatase, and caseinolytic activities was performed 24 hr after irradiation. Cysteamine (75 mg/kg, 10 min before irradiation) or trichlorfon (100 mg/kg, 3 hr before irradiation) significantly ($p < 0.05$) decreased the activities of the pancreatic hydrolases in the majority of cases. It is possible that the radioprotective effectiveness of trichlorfon and cysteamine consists in their influence on the hydrolytic function of the pancreas.

**77-2815.** Kaufman, D. D. ; Haynes, S. C.; Jordan, E. G.; Kayser, A. J. (Agric. Environ. Quality Inst., Agric. Res. Serv., U.S. Dep. Agric. Beltsville, MD 20705) **Permethrin degradation in soil and microbial cultures.** *ACS Symp. Ser. No 42: Synthetic Pyrethroids, ACS, Washington, DC* pp 147-161; 1977. (18 references)

The degradation and persistence of permethrin in aerobic and anaerobic soils and its degradation by *Fusarium oxysporum* in culture were studied. Analysis was by thin-layer chromatography. The results indicated that permethrin was rapidly degraded in soil; degradation of the trans isomer occured more rapidly than degradation of the cis isomer. Microbial metabolism was involved in the degradation process. The major pathway of degradation involved hydrolysis to the dichlorovinyl acid and 3-phenoxybenzyl alcohol moieties. Further metabolism of both products resulted in the evolution of $CO_2$. A tentative pathway of degradation is proposed. The conversion of 3-phenoxybenzyl alcohol to 3-phenoxybenzoic acid in this process presumably occurs through the formation of the corresponding aldehyde, although additional investigation is needed for confirmation. Other possible products would presumably include various hydroxylated parent compounds and hydroxylated cleavage products.

**77-2816.** Soderlund, D. M. ; Casida, J. E. (Pestic. Chem. Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Substrate specificity of mouse-liver microsomal enzymes in pyrethroid metabolism.** *ACS Symp Ser. No. 42:Synthetic Pyrethroids, ACS, Washington, DC* pp. 162-172; 1977. (15 references)

The effect of structural modification on pyrethroid biodegradability by mouse liver microsomal esterase and oxidase preparations was studied using the acid and alcohol moieties of 44 pyrethroids. The microsomal esterase preparations proved to be most important in metabolizing the primary alcohol esters of the cyclopropane-carboxylic acids with *trans* side chains, e.g., isobutenyl or dihalovinyl substituents at cyclopropane C-3. The mixed-function oxidase system predominated during the metabolism of all secondary alcohol esters and primary alcohol *cis*-substituted-cyclopropane- carboxylates. An $\alpha$-cyano group in the alcohol greatly reduced the rate of both enzymatic hydrolysis and oxidation. Mice pretreated with an appropriate esterase or oxidase inhibitor (e.g., 50 mg/kg DEF i.p. 6 hr before pyrethroid treatment or 150 mg/kg PB i.p. 1 hr before pyrethroid treatment) generally showed increased susceptibility to pyrethroid intoxication.

**77-2817.** Gaughan, L. C. ; Unai, T.; Casida, J. E. (Pestic. Chem. Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Permethrin metabolism in rats and**

**cows and in bean and cotton plants.** *ACS Symp. Ser. No. 42, Synthetic Pyrethroids, ACS, Washington, DC* pp. 186-193; 1977. (6 references)

Male Sprague-Dawley rats were given single oral doses (1-4 mg/kg) of eight ($^{14}$C) permethrin preparations, and the urinary and fecal metabolites were studied by thin-layer chromatography. The urinary and fecal metabolites were also studied following the administration of three consecutive daily doses of ($^{14}$C)permethrin to lactating Jersey cows; administration was by stomach tube. Metabolites in bean and cotton plants were studied after topical treatment with or stem injection of ($^{14}$C) permethrin. Permethrin metabolites excreted by the rats and cows included 8 mono- and dihydroxy derivatives of the *trans*- and *cis*- esters, the acid moieties from ester cleavage and their 2-*trans*- and 2-*cis*-hydroxy derivatives, 3-phenoxybenzyl alcohol, and 3-phenoxybenzoic acid and its 2'- and 4'-hydroxy derivatives. These metabolites were excreted without conjugation or as glucuronides and glycine and glutamic acid conjugates of the carboxylic acids and as sulfates of the phenolic compounds. Permethrin on bean and cotton leaves underwent *trans-cis*- photoisomerization and the material absorbed by the plants yielded hydroxy esters and their glycosides, hydrolysis products and their glycosides, and 3-phenoxybenzoic acid. In general, *trans*-permethrin underwent more rapid biodegradation than the *cis*-isomer, partially because the rate of hydrolysis of the *trans* -compound is greater.

**77-2818.** Cohen, S. D. ; Murphy, S. D. (Sect. Pharmacol. Toxicol., School Pharm., Univ. Connecticut, Stoors, CT 06268) **A simplified bioassay for organophosphate detoxification and interactions.** *Toxicol. Appl. Pharmacol.* 27: 537-550; 1974. (33 references)

In the simplified bioassay 0.5 nmol malaoxon or 0.15 nmol paraoxon was incubated with mouse brain with or without addition of a second, detoxifying tissue. After 25 min acetylcholine was added to the flasks and the brain cholinesterase activities remaining were determined manometrically. The difference in brain cholinesterase activities was a measure of the organophospahte detoxifying capacity of the second tissue, and was proportional to the quantity of detoxifying tissue added. Malaoxon detoxification was greatest in mouse liver, but lung, kidney and plasma also possessed considerable activity. Hepatic subcellular fractionation studies demonstrated that malaoxon detoxification was greatest in the microsomes. Administration of TOTP (triorthotolyl phosphate) and other carboxylesterase inhibitors also inhibited malaoxon detoxification in the simplified bioassay. EDTA, an inhibitor of paraoxonase but not of paraoxon binding did not inhibit paraoxon detoxification in the simplified bioassay. TOTP(TOCP), an inhibitor of paraoxon binding but not of paraoxonase, inhibited paraoxon detoxification in the simplified bioassay. These results suggest that the simplified bioassay measures paraoxon binding rather than hydrolysis by paraoxonase. TOTP (125 mg/kg, 18 hr) pretreatment potentiated the anticholinesterase action of paraoxon in vivo. A single pretreatment with aldrin (16 mg/kg, po, 4 days earlier) increased the liver: body weight ratio in the mouse to 130% of control, and increased liver and plasma paraoxon and malaoxon detoxification and liver and plasma carboxylesterase activities. A corresponding decrease was observed in the acute toxicity of paraoxon and malaoxon administered 4 days after aldrin. The simplified bioassay for determining detoxification of malaoxon or paraoxon in vitro may be useful in screening tests for detecting other synergists and antagonists of organophosphate toxicity. (Author abstract by permission)

**77-2819.** Courtney, K. D. ; Ebron, M. T.; Tucker, A. W. (EPA Health Effects Res. Lab., Research Triangle Park, NC 27711) **Distribution of 2,4,5-trichlorophenoxyacetic acid in the mouse fetus.** *Toxicol. Let.* 1(2): 103-108; 1977. (8 references)

To assess the distribution of 2,4,5-trichlorphenoxyacetic acid (TAA 2,4,5-T) in the mouse fetus, CD-1 mice were treated with 100 mg/kg$^{14}$C-TAA on day 13 or daily from day 10-13 of gestation. Concentration of TAA in maternal and fetal tissues were obvious at 30 min, maximum at 8 hr, diminished at 24 hr, and virtually absent at 48 hr. Autoradiographs of whole fetuses demonstrated TAA concentrations in the liver, skin, eyes, and ventricles of the brain. At 48 hr TAA was distributed in fetal muscle, but none was apparent in the palate. The excretion rate of TAA was approximately 60 μg/hr; 52% of the TAA dosage was recovered unchanged in the urine at 24 hr.

**77-2820.** Tagatz, M. E. (US EPA, Environ. Res. Lab., Gulf Breeze, Fl 32561) **Effect of mirex on predator-prey interaction in an experimental estuarine ecosystem.** *Trans. Amer. Fish. Soc.* 105(4): 546-549; 1976. (13 references)

The effect of mirex on predator-prey interaction in an experimental estuarine ecosystem was studied. The tests were conducted over a 14 to 16 day period. The distribution and sublethal effects of mirex were studied. The insecticide was translocated from water at concentrations of 0.011 to 0.13 μg/liter to sand, plant, and animal components. An alteration of predator-prey interaction due to mirex was noted via a significant difference in survival of grass shrimp, *Palaemonetes vulgaris*, in control and treated tanks after one, two, or three days of predation by pinfish, *Lagodon rhomboides*. That more deaths due to predation occurred in treated than in control tanks could be interpreted as an alteration of the normal behavior of either shrimp or pinfish by mirex. However, it is suggested that the behavior of only the grass shrimp was altered. This is supported by the findings of other studies as well.

**77-2821.** Krustev, E. (Vet. Sci. Res. Inst., Veliko Turnovo, Bulgaria) **Izsledvaniia vaurkhu aktivnostta na eritrotsitnata kholinesteraza pri zdravi i otroveni s diptereks ovtse i goveda. [Studies on the activity of erythrocyte cholinesterase in sheep and cattle poisoned with Dipterex and in normal animals.]** *Vet. Med. Nauki (Sofia)* 12(1): 10-15; 1975. (17 references) (Bulgarian)

The effect of Dipterex (trichlorfon), administered in single oral doses of 150-250 mg/kg, on the erythrocyte cholinesterase activity was studied in cattle and sheep. In the untreated control animals, the cholinesterase activity was 82 2.44 U (sheep) and 146 6.13 U (in cattle), respectively. Dipterex caused significant inhibition of the erythrocyte cholinesterase activity in all animals (by 56-100%). The enzyme activity was inhibited by 56-71% even in those animals that showed no clinical symptoms of poisoning, i.e., there was no correlation between the inhibition of the cholinesterase activity and the severity of the poisoning. The erythrocyte cholinesterase activity is consequently a reliable preclinical indicator of poisoning by organophosphorus pesticides.

**77-2822.** Adamec, O. ; Kosutzky, J.; Kirchmayerova, J. (Poultry Res. Inst., Ivanka pri Dunaji, Czechoslovakia) **Zmeny v biologickej ucinnosti androgenov po expozicii kohutikov lindanu. [Changes in the biological effectiveness of androgens after exposure of cockerels to lindane.]** *Vet. Med. (Prague)* 20(7): 433-440; 1975. (11 references) (Czech)

The changes in the effectiveness of androgens after the administration of different doses of lindane to sexually immature cockerels were studied using biochemical test methods. Testosterone propionate and Stenolon (17-methylandrost- 1,4-diene-17-ol-3-one were used as reference hormones. The administration of lindane increased the biological effectiveness of testosterone propionate expressed through the stimulation of growth of the comb. The insecticide caused a statistically highly significant reduction of androgenic activity when Stenolon was used as a reference preparation. Causes leading to different manifestations of the interactions of lindane with the two hormones tested are discussed. The exposure of poultry to relatively low doses of chlorinated insecticides is seen to interfere with the biological effectiveness of sex hormones.

**77-2823.** Adamec, O. ; Kosutzky, J.; Ledec, M. (Res. Inst. Poultry Breeding, Ivanka pri Dunaji, Czechoslovakia) **Vplyv lindanu na biologicku ucinnost estradiolu u kurciat [The effect of lindane on the biological effectiveness of estradiol in chickens.]** *Vet. Med. (Prague)* 20(7): 433-440; 1975. (11 references) (Czech)

The effect of lindane on the biological effectiveness of estradiol was studied in chickens. The sexually immature chickens were exposed to lindane in doses of 2.5 to 25.0 mg/kg in feeds. Changes in the effectiveness of estrogen, expressed by an increase in the mass of the oviduct and of the level of serum calcium, were evaluated by comparing animals exposed to the insecticide with controls. The application of lindane in the quantity of these doses for 14 days caused a statistically conclusive depression of the biological effectiveness of estrogens. Compared with controls, the stimulated mass of the oviduct of exposed animals was smaller than 12.7 to 17.1 %. and the average concentration of serum calcium decreased by 8.0 to 27.6 %. These results indicate that the influence of lindane even at relatively low concentrations caused significant changes in the effectiveness of exogenous estrogens.

**77-2824.** Stupnikov, A. A. (VNIVIP) **Profilaktika otravlyeniy zhivotnykh gerbitsidami i *arboritsidami*. [Prevention of animal poisoning with herbicides and arboricides.]** *Veterinariya* 6: 89-91; 1977. (Russian)

Toxic and ecological properties of herbicides and arboricides which are harmful to warm-blooded animals are presented. The amounts and duration of some residues in the water, soil and plants are also given. The chemicals and their derivatives are given by class and group and are classified as high, medium and low toxins. To prevent poisoning of animals and birds and to avoid contamination of animal products, various times for crop harvesting and cattle pasturing following the use of fertilizers are suggested.

**77-2825.** Jacobs, A. ; Hellmund, E.; Eberle, S. H. (Kernforschungszentrum, Karlsruhe, Germany) **Speicherung von organischen Spurenverunreinigungen des Wassers im Koerper: Zeit- und Dosisabhaengigkeit der Akkumulation von Hexachlorbenzol und Tetrachlorobenzol-derivaten im Rattenversuch. [Accumulation of organic trace contaminants from water within the body: time and dose dependence of the accumulation of hexachlorobenzene and tetrachlorobenzene derivatives in experimental rats.]** *Vom Wasser* 48: 255-272; 1977. (24 references) (German)

The accumulation of hexachlorobenzene (HCB), 1,-2,4,5-tetrachlorobenzene (TCB), 2,4,5,6-tetrachloro-*m*-xylene (TCMX), 2,3,5,6-tetrachloronitrobenzene (TCNB), 2,3,4,5-tetrachloroanisole (TCAN) and 1,2,3,4-tetrachloronaphthalene (TCN) was studied in rats. The animals received daily doses of 0.04-400 mg/kg of these preparations mixed with feed for 8 weeks. The accumulation was studied by the gas-chromatographic determination of these preparations in the blood and abdominal and perirenal fat. The concentrations in the blood showed a sharp increase during the first 3 weeks, reaching a maximum between the first and third weeks of the experiment, after which a constant equilibrium concentration was established. Except for HCB, all other preparations showed similar concentration changes in the adipose tissues; they appeared in the fat shortly after they did in the blood, while it took more time for HCB to appear in the fat. A correlation was found between the doses administered and the equilibrium levels measured in blood and fat. In rats fed 400 mg/kg HCB, the equilibrium concentrations were 25 8 mg/kg in the blood, and 4,100 900 mg/kg in fat; when the dose administered was 0.4 mg/kg, the corresponding equilibrium concentrations were 0.09 0.05 mg/kg in blood, and 3.8 1 mg/kg in fat. The relationship between the dose administered and the organ level of the preparation was found to obey a simple exponential law, which permits extrapolation to the concentrations in drinking water.

**77-2826.** Gzhetotskii, M. I. ; Shkliaruk, L. V.; Dychok, L. A. (Department of Industrial Hygiene, Lvov Medical Institute, Lvov, USSR) **Toksikologicheskaja kharakteristika gerbitsida zeazina. [Toxicological characteristics of the herbicide zeazin.]** *Vrach. Delo* 5: 133-136; 1977. (Russian)

The acute and chronic toxicity of Zeazin (atrazine) were studied on animals. The acute oral LD100 was found

to be 3,000 mg/kg, the i.p. LD100 280 mg/kg in rats; the corresponding LD50 values are 1,400 and 125 mg/kg. Lesions of the central nervous system (excitation followed by depression with reduced respiration rate, motor dyscoordination, clonic and sometimes tonic spasms, reduced tumor of tissues and hypothermia). The animals died within 12-24 hr after oral administration, 4-6 hr after ip administration. Bloody discharge from the mouth, nose and eyes was also observed following i.p. administration. Zeazin was found to have a negligible cumulative property. Long-term experiments with 1/5 and 1/10 LD50 p.o. in rats showed hypercholesterolemia, reduction of the peroxidase and carbonic anhydrase activities, of the hemoglobin levels, neutrophil and monocyte counts, and increased lymphocyte count. Reduced gain in weight was also observed. Zeazin caused no deaths when applied on a 3x3 cm skin surface in a single dose of 2,800 mg/kg. Local skin reaction (wild hyperemia) was observed. When applied to the eye mucosa, Zeazin caused edema of the eyelid and conjunctivitis in guinea pigs, rabbits, and cats. The LD100 for guppies was found to be at the 50 ml/liter level. The concentration of 0.5 mg/liter was harmless for fish.

**77-2827.** Guarino, A. M. ; James, M. O.; Bend, J. R. (Mt. Desert Island Biol. Lab., Salsbury Cove, ME 04672) **Fate and distribution of the herbicides 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) in the dogfish shark.** *Xenobiotica* 7(10): 623-631; 1977. (34 references)

The urinary and biliary excretion, tissue distribution and metabolism of $^{14}$C-labeled 2,4-dichloro- or 2,4,5-trichloro-phenoxyacetic acid (2,4-D or 2,4,5-T) were measured in dogfish sharks, *Squalus acanthias*. Both herbicides are extensively metabolized (> 90%) to the corresponding taurine conjugates, and are excreted predominantly via the urine, where ca. 70% of the administered dose appears within 4-6 days after treatment. The highest tissue levels of 2,4-D or 2,4,5-T were found in liver and kidney. Penetration of both herbicides into the CNS was restricted. Plasma elimination was rapid and the t0.5 for either phenoxyacetic acid was < 45 min. Similarly, rapid clearance was seen from renal tissue. Final t0.5 values for muscle were about 2-3 days while the major organ showing 2,4-D or 2,4,5-T retention was the liver, where t0.5 values were about 5 days for both the herbicides. The overall pharmacokinetics in the dogfish shark for these herbicides resembled those seen in some mammals.

**77-2828.** Buchenauer, H. (Inst. Phytomed. Univ. Hohenheim, Stuttgart, Germany) **Investigations on the in vitro and in vivo transformation of new thioureido derivatives to MCB and EBC.** *Z. Pflanzenkr. Pflanzensch.* 82(10): 604-613; 1975. (19 references)

The conversion of some new systemic fungicides under in vitro conditions as well as their uptake by roots, translocation, and transformation in tomato plants was investigated. The chemicals WII 0647 [*N*-(2-acetamidophenyl)- *N*'-ethoxycarbonyl- *S*-methylisourea], WII 0684 [*N*-(2-acetamidophenyl)- *N*'-methoxycarbonyl- *S*-methylisothiourea], WII 0684 [*N*-(2-benzeneamidophenyl)- *N*'-ethoxycarbonyl- *S*-methylisothiourea] were converted in aqueous solution at room temperature to the corresponding alkyl benzimidazol-2-yl carbamates (EBC and MBC) more rapidly than were methyl thiophanate and thiophanate. The transformation rates of these chemicals increased in the following order: TPE < TPM < WII 0647 < WII 0906 < WII 0684 < WII 0989. Light and pH affect the conversion rates. When the compounds were administered via the roots of tomato plants, MBC and EBC were detected in the shoots.

*see also* 77-2601 77-2631 77-2643 77-2673 77-2701

**77-2829.** Dahl, W. N. ; Holm, A. M. R.; Schroder, K. H. (Univ. Trondheim, Kjem. Inst. NLHT, N-7000 Trondheim, Norway) **The potentiometric determination of pesticides.** *Anal. Chim. Acta* 93: 91-97; 1977. (11 references)

Cholinesterase inhibition may be determined potentiometrically and used as a method for determining organophosphorus insecticide. In this method the acetic acid formed by acetylcholine hydrolysis is sensed by a glass electrode in a weakly buffered system. The insecticide is incubated with cholinesterase for 1 hr at 25°C or 37°C prior to adding to the substrate. Incubation time and temperature effects have been determined. The application of the method is illustrated, based on bromophos and dichlorvos. Detection limits were obtained of 7 ppb for brmophos and 22 ppb for dichlorvos. The initial hydrolysis rates show a linear decrease up to 0.2 μM for bromophos and 1 μM for dichlorvos.

**77-2830.** Drevenkar, V. ; Fink, K.; Kovac, V.; Radic, B.; Vasilic, Z. (Inst. Med. Res. Occupational Health, Zagreb, Yugoslavia) **The fate of pesticides in aquatic environment. III. Thin layer chromatographic method for the determination of abate** *Arh. Hig. Rada, Toksikol.* 28(2): 163-169; 1977. (15 references)

A thin layer chromatographic method for the determination of Abate temephos in the environment is considered. The mode of detection employed was fluorescence quenching. The method was used on samples of natural waters to detect abate in them. The procedure of solvent ratio variation was applied to remove the interferences. This made it unnecessary to use an ambigous clean-up procedure. An extremely sensitive thin layer chromatographic-EI technique is discussed for the detection of Abate. However, this method is not suitable for such determinations due to poor reproducibility.

**77-2831.** George, D. A. ; Halfhill, J. E.; McDonough, L. M. (Yakima Agric. Res. Lab., U.S. Dep. Agric., Yakima, WA 98902) **Synthetic Pyrethroids: residue methodology and applications.** *ACS Symp. Ser. No. 42, Synthetic Pyrethroids* pp. 201-210; 1977. (1 reference)

Analytical methodology was developed for determining the residues of two synthetic pyrethroids, bioethanomethrin ((5-benzyl- 3-furyl)methyl *trans*-( )- (cyclopentylidenemethyl)- 2,2-dimethylcyclopropane carboxylate) and FMC 33297 (*m*-phenoxybenzyl *cis,trans*-( )-3- (2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate). A direct method using gas chromatography and electron capture detection from FMC 33297 is reported. An alternate method was developed, which is applicable to both pesticides and probably other pyrethroids as well. This method involves derivatizing the pyrethroid to increase the sensitivity by electron capture gas chromatography to the nanogram range. The sample is saponified, the alcohol moiety is extracted with methylene chloride, and trichloroacetyl chloride and pyridine are added to form a trichloroacetate ester with the alcohol. After the aqueous phase is acidified, the acid moiety of the pyrethroid is also extracted with methylene chloride; trichloroethanol with pyridine and dicyclohexylcarbamide are then added to form an ester with the acid moiety. The use of two derivatives enhances the reliability of the results. IR and mass spectroscopy were used to confirm the expected structures of the derivatives. Using the methods described, pyrethroid residues were determined of lentil foliage, lentils, green peas, and cabbage; the residues declined 70 to 100% within 7 days of treatment.

**77-2832.** Borthwick, P. W. ; Tagatz, M. E.; Forester, J. (Gulf Breeze Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561) **A gravity-flow column to provide pesticide-laden water for aquatic bioassays.** *Bull. Environ. Contam. Toxicol.* 13(2): 183-187; 1975. (5 references)

A study was conducted which demonstrated that mirex can be introduced into a flow-through aquatic bioassay system without a solvent by means of a gravity-flow column containing mirex bait. Mirex residues in the treated tank water varied between less than 0.010 and 0.125 ppb over the 28 day period of the study. In a second 28 day study the concentration of mirex ranged between 0.032 and 0.52 μg/l. Although the mirex concentrations in the water samples fluctuated, residues differed by less than one order of magnitude. The differences in mean mirex concentrations in tank water may have been caused by seasonal variations in water temperture. Fluctuations in the mirex concentrations within individual tanks were not significant. Presently the described gravity-flow column is being used in seasonal tests to deliver mirex-laden water to determine toxicity and uptake of mirex by several animal species in an artificial estuarine ecosystem.

**77-2833.** Okuno, I. (U.S. Fish Wildlife Serv., Wildlife Res. Cent., Denver, CO 80225) **Method for determining residues of mestranol and ethynylestradiol in foliage, soil, and water samples.** *Bull. Environ. Contam. Toxicol.* 18(4): 428-435; 1977. (4 references)

An analytical procedure was developed for determining residue levels of mestranol and its 3-hydroxy homologe, ethynylestradiol (EED), in plant, soil, and water samples. The lower limits of detection, based on recovery studies, were 0.05 ppm for foliage, 0.1 ppm for soils, and 0.01 ppm for water. The samples were extracted in an acidic medium to free any conjugated EED, then cleaned up by Florisil column chromatography. The water samples were usually ready for gas-liquid chromatographic (GLC) analysis at this point. The vegetation and soil samples were further cleaned up, with separation of mestranol from EED, on a gel permeation chromatographic column. The EED fraction from this gel separation was clean enough for GLC analysis, and the mestranol fraction was cleaned up further by a second gel separation and one or more additional Florisil separations. After GLC, the samples were analyzed by thin-layer chromatography for qualitative and semi-quantitative confirmation. Recoveries from mixed foliage samples averaged 38% for mestranol and 56% for EED, or 75% and 79% after correction for the losses due to the various clean-up steps. Recoveries from soil averaged less than 50%, even after correction,

and recoveries from water averaged 99% for mestranol and 73% for EED (79% after correction).

**77-2834.** Hild, J. ; Thier, H. P. (Inst. Lebensmittelchem., Univ. Munster, Germany) **Aufarbeitung von Pflanzenmaterial zur schnellen Rueckstandsanalyse lipoid- und wasserloeslicher Organophosphor-Pestizide. [Workup of plant material for rapid residue analysis of lipid- and water-soluble organophosphorus pesticides.]** *Deutsch. Lebensmittel Rundschau* 73(10): 330-332; 1977. (6 references) (German)

Organophosphate pesticide residue analysis was carried out on plant material. Extraction was performed using acetonitrile. Co-extracted water was separated from the extract by the addition of methylene chloride. The remaining organic layer was then evaporated to dryness and analyzed by gas-liquid chromatography with alkali flame thermionic detection. High recoveries with minimal interference were obtained for both non-polar and water-soluble organophoshate pesticides.

**77-2835.** Addison, J. B. ; Semeluk, G. P.; Unger, I. (Dept. Chem., Univ. New Brunswick, Fredericton, N. B. E3B 5A3, Canada) **The luminescence properties of pesticides. I. Fluorescing and phosphorescing carbamates.** *J. Luminescence* 15(3): 323-339; 1977. (21 references)

The fluorescent and phosphorescent properties of phenmec, matacil, metacrate, landrin, zectran (mexacarbate) and sevin (carbaryl) were studied by emission and absorption spectroscopy. All spectra were obtained at room temperature and 77°K with 0.1-1m*M* pesticide in EPA (ether/isopentanol/ethanol, 5:5:2). The results of these studies should be helpful in developing methods for the qualitative and quantatative analysis of carbamate pesticide residues.

**77-2836.** Kumar, Y. ; Semeluk, G. P.; Unger, I. (Dep. Chem., Univ. New Brunswick, Fredericton, New Brunswick, Canada E3B 5A3) **The luminescence properties of pesticides. II. Non-fluorescing carbamates.** *J. Luminescence* 15(3): 341-347; 1977. (16 references)

Some luminescent properties of four phenyl-*N*-methyl carbamates (azak or terbatol, dazak, mesurol or methiocarb, meobal or MPMC) which exhibit phosphorescence only, are presented. These studies were carried out in there different solvents -- EPA (ether, isopentanol, ethanol, 5:5:2), isopropanol, or 3-methylpentane -- and the effects of these solvents on the spectral properties of the compounds studied is discussed. All emission and excitation measurements were carried out on a fully compensated spectrophotometer at 77 °K. The phosphorescence spectrum in each case consisted of a broad structureless band with a maximum between 420 and 450 nm. The excitation spectra were similar to the first bands of their individual UV absorption, spectra, except that moebal and azak also exhibit phosphorescence excitation at 227 nm. Data on phosphorescent lifetimes were also obtained. These lifetimes were sensitive to solvent, excitation wavelength, and emission wavelength selected for monitoring. The *o,p*-alkyl substitution of the carbamate ring may be responsible for the lack of fluorescent activity in these molecules.

**77-2837.** Reish, D. J. ; Kauwling, T. J. (Dep. Biol., California State Univ., Long Beach, CA) **Marine and estuarine pollution.** *J. Water Pollut. Control Fed.* 46(6): 1437-1451; 1977. (151 references)

Studies of marine pollution are reviewed. Sources of marine pollution, techniques, of measuring pollution, and pollution prevention are emphasized. Waste disposal, oil spills, radioactivity, heat, and pesticides are discussed in terms of their effects on marine organisms. Possible solutions to these problems, compiled from studies of the Columbia River Estuary, Southern California Bight, Chesapeake Bay, and Port Phillip Bay in Australia are presented. The primary causes of these pollution problems were radioactivity from the Hanford generating plant on the Columbia, domestic and industrial wastes in the southern California Bight and Chesapeak Bay areas, and domestic and storm wastes in Port Philip.

**77-2838.** Sivorinovskii, G. A. (Emergency Treatment and Hemodialysis Lab., Odessa Regional Clin. Inst. Odessa, Ussr.) **K voprosu ob opredelenii aktivnosti kholinesteraz. [Determination of cholinesterase activity.]** *Lab. Delo* 2: 92-94; 1977. (7 references) (Russian)

A rapid method for the routine potentiometric determination of cholinesterases is described. The method is based on the measurement of the pH of the incubation medium. The cholinesterase activity is calculated from a curve showing the equivalent amount of acetylcholine destroyed as a function of the pH shift caused by the addition of acetic acid. The error of the determination does not exceed 3%. The method is suitable for rapid diagnosis of poisoning by organophosphorus pesticides, morphine, myocardial infarction, and other conditions related to pathology of the cholinergic systems.

**77-2839.** Dawson, R. ; Riley, J. P. (Inst. Meereskunde, Univ. Kiel, Kiel, West Germany) **Two samplers for large-volume collection of chlorinated hydrocarbons.** *Marine Chem.* 4: 83-88; 1976. (9 references)

Two types of sampling devices for the large-volume, in situ collection of chlorinated hydrocarbons from water are discussed. Both devices make use of an Amberlite XAD-2 macroreticular adsorbent resin column. One device is a self-powered pump which is inexpensive to construct, can be left unattended at a fixed station, and is serviced by divers. The other device is a fish sampler which is towed behind a ship. This type of sampler has been successfully used for PCB analysis in the waters surrounding the British Isles. These samplers can detect PCB in the water at concentrations below parts per trillion.

**77-2840.** Martens, M. ; Martens, F.; Heyndrickx, A. (Dep. Toxicol., State Univ. Ghent, Belgium) **The determination of**

**paraquat in 1-ml blood samples by means of pyrolysis - NFID - GLC.** *Proc. Eur. Soc. Toxicol.* 18: 183-185; 1977.

A method for the determination of paraquat residues in blood is presented. The paraquat sample is first pyrolyzed to 4,4-bipyridine, then analyzed by GLC with NFID. Linear responses with regression coefficients of 0.984 and 0.974, respectively, were obtained with samples having paraquat concentrations in the ranges of 0.1 to 1.5 ppm and 0.02 to 0.5 ppm. The recovery rate from blood samples spiked with 0.5 ppm paraquat is 93% with a coefficient of variation of 22% when at least 5 experiments are considered. This method is applicable to samples as small as 1 ml and takes 1.5 hr to complete.

**77-2841.** Krull, I. S. (Author address not given) **Recent advances of PCB analysis.** *Residue Rev.* 66: 185-202; 1977. (101 references)

Polychlorinated biphenyls (PCB) as a group are among the more widespread and persistent environmental pollutants. Because of their widespread distribution (in almost all bodies of water, in soil, in air, in plants, in animals) and possible deleterious effects of biological systems including man the need for monitoring PCB is apparent. The evolution of high pressure liquid chromatography (HPLC) coupled with vapor pressure chromatography (VPC) makes possible for the first time rapid, efficient, and reproducible separation and analysis of PCB from other organic and inorganic pollutants found in the physical and biological environment. Routine PCB analysis of environmental samples using these techniques with the aid of computers is now routinely done by a number of groups.

**77-2842.** Kumpulainen, J. ; Koivistoinen, P. (Author address not given) **Advances in tin compound analysis with special reference to organotin pesticide residues.** *Residue Rev.* 66: 1-18; 1977. (39 references)

Organotin compounds currently used as pesticides include tricyclohexyltin hydroxide, triphenyltin hydroxide, and triphenyltin acetate and chloride. Because of the physical and chemical similarity of these compounds, analysis of specific residues can be difficult. Total tin in a sample can be analyzed by the dithiol or pyrocatechol violet colorimetric methods and the fluorometric method. These methods are not recommended for use to assess organotin pollution in food, even when the organotin source is known, because the natural tin content of foods varies unexpectedly. GLC methods exist for the quantitation of tricyclohexyltin hydroxide and triphenyltin compounds, but these methods are either laborious or not sensitive enough. There is a need for an analytical system in which organotin compounds, especially the organotin pesticides, can be separately and quantatively analyzed from a polyglot sample. It would be helpful to further characterize the occurrence and composition of tin occurring naturally in biological materials.

**77-2843.** Simonaitis, R. A. ; Cail, R. S. (Stored Prodcut Insects Res. and Development Lab., Agr. Res. Serv., U.S. Dep. Agric., Savannah, GA 31403) **Gas chromatographic determination of residues of the synthetic pyrethroid FMC 33297** *ACS Symp. Ser. No. 42 Synthetic Pyrethroids, ACS, Washington, DC* pp. 211-223; 1977. (5 references)

A simple and rapid gas-liquid chromatographic (GLC) method was developed for the determination of permethrin insecticide residues in corn, corn meal, flour, and wheat. The milled and unmilled grains were extracted with pentane and cleaned up by partition with acetonitrile and pentane followed by liquid chromatography. The resulting permethrin residue was determined by GLC with flame ionization detection. The results were compared with those obtained with known standards which had undergone the same cleanup procedures. With electronic integration, the method was quantitative for permethrin concentrations down to 0.2 ppm. With peak height measurement of the *trans* isomer peak, the method was sensitive to 0.05 ppm insecticide. Recoveries at levels of 0.20 and 22.0 ppm ranged from 88 to 105%, recoveries for the various grains being 88-105% for corn, 92-103% for cornmeal, 90-95% for flour, and 88-95% for wheat. Reproducibility was good. The standard deviation for five determinations at levels of 0.06 and 4.7 ppm was 0.018 to 0.14% absolute for the four grains.

**77-2844.** Thielemann, H. (Hygiene-Inst., Martin-Luther-Univ. Halle-Wittenberg, 402 Halle, DDR) **Vergleichende Untersuchungen zur Ermittlung der duennschichtchromatographischen Nachweisgrenzen (semiquantitative Bestimmung) von DDT und DDE unter Verwendung unterschiedlichen Sorptionsschichten und Spruehreagenzien. [Comparative studies on TLC detection limits for DDT and DDE with different sorption layers and spray reagents.]** *Z. Chem.* 17(4): 144-145; 1977. (German)

The thin-layer chromatographic detection limits for DDT and DDE were studied as a function of the sorption layer (Silufol, silicagel G and D, silicagel G + Silpearl, and FND sheets) and spray reagent (ammoniacal silver nitrate solution, Rhodamine B, bromophenol blue/silver nitrate, methyl red, methyl violet, and methyl orange) used. Both the detection limit and the limit of semiquantitative determination were lowest for Silufol sheets with ammoniacil silver nitrate solution or Rhodamine B. 0.05 and 0.1 μg for DDT, and 0.08 and 0.8 μg for DDE, respectively.

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